## United States Department of Agriculture,

OFFICE OF THE SECRETARY.

## NOTICE OF JUDGMENT NO. 382, FOOD AND DRUGS ACT.

## ADULTERATED AND MISBRANDED BLEACHED FLOUR.

On or about July 10, 1909, the Aetna Mill and Elevator Company, Wellington, Kansas, consigned and shipped into the State of Louisiana certain flour contained in sixteen bales of twenty-four pound sacks, sixteen bales of twelve pound sacks, four hundred and twenty bales of ninety-eight pound sacks, and twenty barrels, each of which sacks and barrels were labeled and branded as follows: "Aetna Mills—Aetna Silk—High Patent—Aetna Mills and Elevator Company." An inspector of the Bureau of Chemistry of the United States Department of Agriculture reported that this particular lot of flour, in large part, had been milled from what is ordinarily called soft wheat, made as a straight grade, to which other clear flour was added and mixed, and that after milling the flour had been bleached by the Alsop process. As it appeared from the report made that the flour was adulterated and misbranded within the meaning of the Food and Drugs Act, the Secretary of Agriculture requested the Attorney General to have seizure of the shipment effected under the authority of Section 10 of the Act. In due course, a libel was filed in the United States District Court for the Eastern District of Louisiana, praying seizure and confiscation of the flour, in substance and form as follows:

IN THE DISTRICT COURT FOR THE EASTERN DISTRICT OF LOUISIANA.

To the Honorable Rufus E. Foster, Judge of the United States District Court for the Eastern District of Louisiana,

The libel of Information of the United States of America herein appearing by Charlton R. Beattie, United States Attorney, in and for the District aforesaid, who in this case prosecutes in their behalf and is duly authorized therefor, respectfully represents:

1. That three hundred and fifty sacks of flour of the kind hereinafter fully set out have been shipped by railroad from the State of Kansas, in Rock Island Car #31901 into the State of Louisiana, in the Eastern District thereof, to L. Fay & Company,

New Orleans, branded "Aetna Mills—Aetna Silk—High Patent," and is now within the jurisdiction of this Honorable Court, or if same has not yet arrived, will soon be within the jurisdiction of this court pursuant to shipment here as aforesaid, from the State of Kansas into the City of New Orleans; that the said flour is adulterated and misbranded within the meaning and intent of Act of Congress of June 30, 1906, known as Food and Drugs Act; that same is subject to seizure and condemnation; that said flour has not been unloaded as libelant believes from the car in which it was shipped into this State, but that if it has been unloaded, same yet remains in the original packages in the possession and keeping of L. Fay & Company, within the jurisdiction of this court.

- 2. That the Aetna Mill and Elevator Company of Wellington, in the State of Kansas, shipped and caused to be shipped and transported the said 350 sacks of flour from the State of Kansas into the State of Louisiana, consigned as aforesaid to L. Fay & Company, in the City of New Orleans and State of Louisiana.
- 3. That the said flour is a food within the meaning and intent of Act of Congress of June 30, 1906, and that same is and was adulterated within the meaning and intent of said act at the time of its shipment, as aforesaid, from the State of Kansas into the State of Louisiana, in the following manner and particulars, to-wit:

That the said so called flour is a mixture of straight flour milled from soft new Winter wheat and twenty per cent clear from old hard wheat; clear being a product of the second run of flour from the mill and an inferior commercial flour, being darker and a different product from the first run or patent flour; that said clear thus mixed with straight flour had been and was bleached before shipment from the State of Kansas into the State of Louisiana with nitrogen peroxide; that by the use of said clear, thus bleached with nitrogen peroxide, with the straight flour, the said mixture thus shipped by interstate shipment into the State of Louisiana, has been colored and stained, in a manner whereby damage and inferiority are concealed, and the said mixture, one of the ingredients of which has thus been bleached by nitrogen peroxide, as a result of said bleaching contains added poisonous and deleterious ingredients which may render such article injurious to health, namely, "nitrites" and the quality and strength of the product by the said bleaching and mixture, have been lowered and injuriously affected; that the said mixture was further adulterated in this that the straight flour has been mixed and packed with the said clear as aforesaid, so as to reduce and lower and injuriously affect its quality and strength, and said clear has been in part substituted in said mixture for the straight flour—all prior to said interstate shipment into Louisiana.

4. That the said flour thus shipped by interstate shipment into the State of Louisiana, is a food within the meaning and intent of the Act of Congress of June 30, 1906, and that same is misbranded and was misbranded within the meaning and intent of said Act at the time of its shipment, as aforesaid, from the State of Kansas into the State of Louisiana, in the following manner and particulars, to-wit:—that the said mixture was labeled as aforesaid, "Aetna Mills—Aetna Silk—High Patent," whereas, in truth and in fact it is not high patent, but is a mixture of twenty per cent clear ground from old hard wheat, with a flour ground from new soft Winter wheat, clear being a product of the second run of flour from the mill and an inferior commercial flour, being darker and a different product from the first run or patent flour, and that the mixture thus shipped for sale into the State of Louisiana was and is offered for sale under the distinctive name of another article than itself, and it was labeled as aforesaid so as to deceive and mislead the purchaser; and that the label bears the statement that it is High Patent and is false and misleading in that it leads one to believe that it is an un-adulterated High Patent Flour, whereas, in truth and in fact, as aforesaid, it is a mixture of straight flour with clear, and that by reason of the fact as aforesaid, that said clear, mixed with the straight flour, has been bleached with

nitrogen peroxide, the mixture thereof contains poisonous and deleterious ingredients known as "nitrites."

Wherefore, the premises considered, libelant prays that process of monition issue in due form and in accordance with the course of this Honorable Court against said flour; that same be arrested and seized thereunder and that all persons having and pretending to have an interest in same be cited to appear and answer hereto and that in due course said flour be condemned and ordered confiscated and forfeited to the United States, and destroyed, and that libelant may have such other orders and further relief as the nature of the case may require and for all general relief.

CHARLTON R. BEATTIE,
United States Attorney.

The following amendment to the libel was filed thereafter by leave of court:

IN THE DISTRICT COURT FOR THE EASTERN DISTRICT OF LOUISIANA.

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United States of America, Libelant, versus
350 Sacks of Flour.
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To the Honorable, Rufus E. Foster, Judge of the United States District Court for the Eastern District of Louisiana.

The amended libel of information of the United States of America herein appearing through Charlton R. Beattie, United States Attorney, in and for the District aforesaid, who in this case prosecutes in their behalf and is duly authorized so to do, respectfully represents:

That in the original libel of information herein filed, the quantity of flour shipped by interstate shipment into Louisiana, in violation of Food & Drugs Act, June 30, 1906, was alleged to be three hundred and fifty sacks of flour,

Libelant now desires to amend said original libel of information by averring that since the filing of the original libel, libelant has learned and now avers that the quantity of flour contained in car set out in original libel, being Rock Island car #31901, C. R. I. & P., is sixteen bales of 24 lb. sacks; sixteen bales of 12 lb. sacks, four hundred and twenty 98 lb. sacks and twenty barrels.

Libelant, further, desires to amend the original libel herein filed and does so now amend it by averring that the interstate shipment of flour, of the quantity just above mentioned, and in the manner and under the circumstances set forth in the original libel was consigned to McCloskey Brothers, New Orleans, Louisiana, instead of to L. Fay & Company as averred in the original libel, this information having come to libelant since the filing of the original libel.

Libelant now reiterates and reaffirms all of the allegations and averments contained in the original libel herein filed, with the exception of those herein amended and makes part hereof said original libel.

Wherefore, the premises considered, libelant prays for leave to file this Amended Libel and that process of monition issue in due form and in accordance with the course of this Honorable Court against said flour; and that same be arrested and seized thereunder and that all persons having and pretending to have an interest in same be cited to appear and answer hereto and that in due course said flour be condemned and ordered confiscated and forfeited to the United States and destroyed, and that libelant may have such other orders and further relief as the nature of the case may require and for all general relief.

Process issued in due course and the aforesaid shipment was arrested and seized at Wilson, Louisiana, in the possession of the carrier. Samples, to wit, four twenty-four pound sacks, were pro-

cured at the time of seizure by an inspector of the Bureau of Chemistry of the United States Department of Agriculture and forwarded, properly wrapped, sealed, and packed, to laboratories at Washington, D. C., Chicago, Illinois, St. Paul, Minnesota, and New Orleans, Louisiana, for examination and analysis. The Aetna Mill and Elevator Company duly entered its appearance as claimant and thereafter filed its answer to the said libel, but subsequently, pursuant to an order of court, withdrew its answer and filed exceptions to the libel, alleging in substance and in form as follows:

IN THE UNITED STATES DISTRICT COURT FOR THE EASTERN DISTRICT OF LOUISIANA, BATON ROUGE DIVISION. (TRANSFERRED TO NEW ORLEANS DIVISION.)

EXCEPTIONS TO LIBEL.

The Aetna Mill and Elevator Company, owner and claimant of the 420 Sacks, et al of Flour seized under the libel filed herein hereby excepts to the libel of the United States of America against the said flour for the following reasons:

First. That the Food and Drugs Act, June 30, 1906, under the authority of which the libelant herein instituted these proceedings, is wholly invalid, unconstitutional and void in that said Act in terms and by intendment is in violation of Article 1, Section 8, Paragraph 3, of the Constitution of the United States, and is further in violation of so much of Article 5 of the Amendments to the Constitution of the United States as prescribed that no person shall be deprived of life, liberty or property without due process of law; and is further in violation of Article 10 of the amendments to the Constitution of the United States.

Second. That the said act, known as "Food and Drugs Act, June 30, 1906," is wholly illegal and void by reason of the fact that it is uncertain and indefinite and that said uncertainty and indefiniteness apply to the whole of said law, and particularly in this, that the law itself does not define any standard of grade, quality or purity and in this regard delegates legislative functions to the court clothed with jurisdiction of cases of a civil or criminal nature brought under this law.

And that therefore this Honorable Court has no jurisdiction and ought not to proceed to enforce the claim alleged in the libel aforesaid, against said 420 Sacks, et al of Flour, or against this claimant for his interest therein.

Wherefore claimant prays that the libel herein may be dismissed with cost.

(Signed) A. E. Helm, Claimant's Proctor.

After argument and due consideration thereof, the exceptions were overruled. The court, speaking by Foster, D. J., said:

UNITED STATES DISTRICT COURT, EASTERN DISTRICT OF LOUISIANA.

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THE UNITED STATES, vs. 420 Sacks of Flour. No. 14173.
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In this case a libel was filed by the United States against 420 sacks of flour alleged to have been brought into Louisiana by inter-state shipment from Kansas, in violation of the Food and Drugs Act.

[No. 382]

The Aetna Mill and Elevator Company has claimed the flour and filed exceptions to the libel on the following grounds:

"First—That the Food and Drugs Act, June 30, 1906, under the authority of which the libelant herein instituted these proceedings, is wholly invalid, unconstitutional and void, in that said Act in terms and by intendment is in violation of Article 1, Section 8, Paragraph 3, of the Constitution of the United States, and is further in violation of so much of Article 5 of the amendments to the Constitution of the United States as prescribed that no person shall be deprived of life liberty or property without due process of law; and is further in violation of Article 10 of the amendments to the Constitution of the United States.

"Second—That the said Act, known as the Food and Drugs Act, June 30, 1906, is wholly illegal and void by reason of the fact that it is uncertain and indefinite and that said uncertainty and indefiniteness apply to the whole of said law, and particularly in this, that the law itself does not define any standard of grade quality or purity and in this regard delegates legislative functions to the Court clothed with jurisdiction of cases of a civil or criminal nature brought under this law."

It is urged by claimant that Congress intended to, and in fact has, enacted a police regulation, and that having such intention, the power vested in Congress to regulate inter-state commerce is insufficient to validate the Act.

I cannot agree with this contention. To my mind it is immaterial what the intention of Congress was, if it had the power to enact the legislation. That it did so have, I consider well settled. In the Lottery case (188 U. S. 321) the Supreme Court upheld the validity of the law prohibiting the sending of lottery tickets from one state to another, and reasoning by analogy, it seems perfectly clear that Congress can prohibit the shipment in interstate commerce of food that has been adulterated, or labeled so as to defraud or mislead the public.

The second contention I consider equally without merit. While the Act is necessarily broad in its terms, the courts can well protect the rights of parties in each particular case by requiring specific and properly drawn pleadings.

The exceptions must therefore be overruled.

The claimant thereupon asserted its intention to take appeal from the ruling of the court and declared in open court by its proctors no answer would be made by it to the libel. Thereupon, after the delays allowed by law had clapsed, the court pronounced the claimant in contumacy and default, adjudged the libel to be taken proconfesso, and proceeded to hear the cause ex parte. A commissioner was duly appointed, before whom the United States of America, libelant, offered testimony in substance as follows:

## B. C. Winslow, Inspector of the Department of Agriculture:

I saw the flour described in the libel milled and loaded into the car at Wellington, Kans. The flour was milled from soft wheat, or what ordinarily is called soft wheat, and a straight grade, to which other clear flour was added and mixed, and it was packed under the label "Aetna Silk High Patent Flour." The flour was bleached by the Alsop process before it was passed into the packing room. I have observed the Alsop process in a large number of mills throughout the United States. The process, in its essential parts, consists of an apparatus for the manipulation of an electrical current which produces

nitrogen peroxide gas; and an air pump, pumping a current of air which is mixed or mixes with the gas, and a receptacle for mixing the The gas diluted with air passes from the generator to the agitator, when the flour and gas are brought into close contact. The gas used has a disagreeable odor, which was very marked at the Aetna Company's mill and in the car in which the flour was shipped. "Patent" flour, in the science and art of milling, is understood to be flour made from purified middlings. To the consumer, patent flour means the best grade of flour. It commands the highest price in the "Clear" flour is a mixture of the odds and ends in milling excluding middlings, although clear flour frequently contains the purest quality of middling stock from the tail of the mill. "Straight" flour, or straight grade, means all the contents of the wheat fit for consumption. The low grade flour is called "Red Dog," and is essentially a stock feed. Patent flour, if properly milled, is whiter than straight or clear. Straight flour is whiter than the clear. described in the libel was much whiter after bleaching. after milling and before it passed into the agitator, was darker than After the flour came out of the agitator the color was as light as that of good patent flour. The contrast between the color of the flour before and after bleaching was strong.

F. L. Wollard, Inspector, United States Department of Agriculture, testified to the taking of samples of the flour after seizure, on July 26, 1909, and the manner of marking, sealing, and forwarding same to laboratories of the Department of Agriculture at Washington, D. C., Chicago, Illinois, St. Paul, Minnesota, and New Orleans, Louisiana, respectively.

Andrew L. Winton, Chief of the Chicago Laboratory, United States Department of Agriculture; Ph. B. and Ph. D., Yale University; studied also at Graz University (Austria); 23 years Chemist, Connecticut Agricultural Experiment Station; examined food products at the Connecticut Experiment Station, and has continued this line of work during three years service in the Department of Agriculture; author numerous scientific articles on the chemistry of foods and microscopy of foods; assisted in the revision of Leach's Food Inspection and Analysis, a comprehensive work on foods and the analysis of foods:

Since the fall of 1907, bleaching of flour has been my chief line of investigation. I have visited more than twenty mills where flour is bleached by the Alsop process. This process consists essentially of two parts—the generator for producing nitrogen peroxide and pumping it to the place where the bleaching is performed; and second, the agitator, where the flour is commingled with the bleaching gas.

The generator consists essentially of a chamber containing electrodes, which, by a mechanical device, are caused to approach and recede, thus making and breaking a circuit of high potential, and causing a flaming discharge of electricity within this chamber. By this flaming discharge a portion of the nitrogen and oxygen of the air, within the chamber, are caused to unite chemically, forming nitro-The same mechanical force which makes and breaks gen peroxide. the electric current also operates a pump, which forces the air containing the nitrogen peroxide into the agitator through a metal pipe. Various forms of agitators are used, some horizontal with arrangements for moving the flour from one end to the other, others vertical, in which the falling flour meets with obstructions which aid in mingling the flour with the bleaching gas. The result secured in all forms of agitators is the same, namely, the mixing of the flour with the bleaching gas and the bleaching of the flour. The bleaching agent is a nitrogen peroxide gas diluted by atmospheric air. In the process, the gas forms with the moisture of the flour equal molecules of nitrous acid and nitric acid, formed as free acids.

It is my opinion that a considerable part of these acids remains in the flour as free acids, presumably in solution. Nitrogen peroxide gas is reddish in color, highly corrosive, with a strong suffocating chemical odor. Diluted, the gas is lighter in color, and when diluted to the extent ordinarily used in the Alsop process, might not be visible to the eye, but is evident from its pungent odor, which I have often observed in visiting the mills. Hundreds of samples of flour, bleached and unbleached, from mills in different sections of the country, have been examined under my supervision at the Chicago Laboratory. On July 29, 1909, I received the sack of flour described by Inspector Wollard as bearing the number 5671-b. After stirring thoroughly the contents of the sack, samples were taken therefrom and examined under my direction. We found that the flour had been bleached by a process which introduced into the flour nitrous acid and which also bleached the coloring matter which is associated with the fat of the flour. The same chemical changes were observed as are brought about in the bleaching of flour by the Alsop process. Nitrous acid forms combinations with bases known as nitrites. Nitrous acid, whether free or combined, has a poisonous action. The first analysis of the flour disclosed the presence of .40 parts nitrogen as nitrous acid per million of flour, .51 per cent of ash and 1.09 per cent of fat. The ash found was in excess of the quantity present in a true "patent" flour which indicated the flour to be of lower grade than ordinary "patent" flour.

After the flour had been stored some time during the hot summer months, another analysis was made and the same quantity of ash

and fat was found, but there was less nitrogen as nitrous acid present than at the time of the former analysis. In my opinion, nitrous acid present in bleached flour diminishes with the lapse of time. Bleaching by the Alsop process changes the chemical and physical character of the flour, the fat losing in some degree its power of combining with iodine, the effect being to give, by a standard method, a lower iodine number. In my opinion, the bleaching of flour injures the quality and flavor of the flour for baking purposes. The flour in question was inferior to "patent" flour, although bleaching had served to give it the color of the more valuable flour. honored method of judging flour has been by its color. of flour does not appreciably affect the percentage of the ordinary food elements, such as starch, gluten, and other proteins, but the fat is altered to some extent. The flavor of such flour is injured without gain in nutritive qualities. The quality of the flour is not improved at all. Bread made from unbleached flour is yellower than bread made from bleached flour. Nitrites, nitrous acid, or nitrous reacting materials are not normally in wheat and are not found in commercial unbleached flours. In my opinion, one-third to one-half of the nitrate reacting materials found in the flour received from Inspector Wollard would remain in bread made therefrom.

Andrew S. Mitchell, Chief of the St. Paul Laboratory, United States Department of Agriculture; Ph. C., University of Michigan; analytical chemist; formerly State Analyst for the Wisconsin Dairy and Food Commission; also Chemist for the Wisconsin State Board of Health; taught chemistry and toxicology in the Milwaukee Medical College and School of Dentistry:

I have made a special study of flour bleaching with respect to the effect of bleaching upon the flour and its constituents and upon bread and other food products made from the flour. Examination was made in the St. Paul Laboratory, under my supervision, of a part of the contents of a 24-pound sack of flour, numbered 5672-b and bearing seals dated July 26, 1909, and signed Frank L. Wollard. There was extracted from the flour with water nitrite reacting material in sufficient quantity to prove beyond question that nitrogen peroxide had been added to the flour. It was evident that the flour had been artificially bleached because the color of the fat was lowered; the color having been altered so as to make the flour appear of a higher grade and quality than it actually was. Nitrogen peroxide is a poisonous, irrespirable gas of a brownish-red color and a suffo-The nitrogen peroxide gas combines with the moisture of the flour so as to form nitrous acid and nitric acid. nations of nitrous acid are poisonous. Treatment with nitrogen peroxide injured the quality and strength of the flour in the following particulars: First, bleaching impaired its flavor; second, the fat was chemically and physically altered to its detriment; third, the gluten of the flour was affected so that it did not go through the normal process which is known to the miller and baker as conditioning or improving, and was thereby stopped from further improvement.

Analysis of samples of this particular lot of flour, made between August 2 and August 5, showed an acid content of .145 per cent and an ash content of slightly over .49 per cent. "Clear" flour is that portion of the flour which is abstracted from the whole percentage of the flour in the manufacture of patent flour. "Clear" flours are frequently divided into first and second quality flours. "Straight" flour contains all the edible portions of the flour obtained from a given wheat. A "patent" flour is made from the purified middlings, with or without certain of the break flours, which are sufficiently pure and free from dirt or branny material so as not to lower its quality and it is the best selected portions of the flour made from a given wheat. The percentage of flour used in a "patent" may vary from one-half to quite a high percentage of the wheat, but is always less than in the "straight," that is, the manufacture of a "patent" flour always results in a "clear" flour as well. The flour examined was not a "patent" flour, although it resembled a "patent" flour in color. The bleaching of this flour also injured its bread-making qualities; it acted upon the fat and the gluten in such a way as to injure the flavor; it acted on the gluten so as to injuriously affect the texture of the bread made from it. Although the sample of flour was branded "Aetna Silk-High Patent" the bread made from it was inferior in color, flavor, in volume of the loaf and texture of the crumb of bread made from a true "patent" flour. The bread which might have been made from this same flour unbleached would have been superior in every way, except in color, which would have been more creamy and not of the ashy or bluey whiteness.

A special study was made in the St. Paul Laboratory to ascertain whether or not nitrous acid or nitrite reacting material added to the flour by the Alsop bleaching process remains in the bread as ordinarily made in bakeries or the kitchens of the people. These investigations showed that bread made from this flour, at or about the time of its shipment and seizure, contained a portion of the nitrites present in the flour. These nitrites would, under ordinary conditions, be dissolved and freed from the combination in which they entered into the stomach. Nitrite reacting material, in my opinion, based on examination of a large number of samples, is not a normal constituent of wheat flour. The apparent effect of the bleaching of flour is to raise its acidity, but as the amounts of acids formed from the gases are so small, under ordinary conditions, they do not show their increase

under our methods of making examinations. Bleaching seems to check the development of the normal acidity of flour, which seems to be due to development of organic acids through enzymes, which are present in the living cells of the flour. Bleaching alters the character of the fat, both physically and chemically, rendering the yellow semifluid oil of the wheat a colorless and almost solid fatty body devoid of flavor and having a musty, undesirable, stale, rancid odor. odor remains after the baking process. Natural aging of flour improves its color, which becomes lighter, but remains of the same creamy cast, improves the gluten for a certain period of time; the gluten becoming more elastic, makes the flour so that it will hold more water, and makes a dough of a given stiffness and bread of a given quality; in other words, improves the bread-making qualities of the flour. Bleaching arrests all such improvement or development in the gluten and does not improve its elasticity. Unbleached flour will improve in quality for a certain time. Bleached flour will not improve with the lapse of time, either in color, quality, or strength. Bleached flour cannot be identified by its color on mere inspection. Color is the most available index of quality to the purchaser and bleaching destroys this index in all instances.

J. H. Shepard, Professor of Chemistry in South Dakota State College and Chemist of the Agricultural Experiment Station for 22 years; Chemist of the South Dakota Pure Food Commission for 9 years; author of several text-books on chemistry in general use throughout the United States; graduate of the University of Michigan; member of the American Chemical Society:

I have made many investigations of the nutritive value of all the common plants of South Dakota, including grains and grasses, and during the last five years have been engaged in the determination of a co-efficient of digestibility for grains, forage plants, and grasses. have made exhaustive investigations on the Durum wheats and other wheats introduced into the United States by the Department of Agriculture, and have made many experiments to determine facts which govern the digestion in vitro. I have had many conferences with experts on the subject of foods, flours, and the like, both in this country and in England, and about a year ago was called to London to testify in the Court of Chancery on the question of the wholesomeness of bleached flour. I am familiar with the process of milling flour and have an experimental mill in my own laboratory, where I have personally milled a very large number of samples of flour. "Patent" flour is made from purified middlings. It may also contain a small quantity of break flour, dependent on the way in which the miller grinds. If 55 per cent of all the flour obtainable from the wheat should go into first "patent," that would make strictly firstclass "patent;" some millers, desiring gain, push this still further until they get 65 to 75 per cent, but that ought not to be called firstclass "patent:" "Clear" flour is the flour remaining after separation of the patent flour, not including "red dog flour." "Straight" flour is the entire flour obtainable from the wheat and includes both the patent and the clear. Flour milled as "straight" grade, from wheat grown the same year as the milling, to which was added 15 or 20 per cent clear grade of flour, made from an old hard wheat, all the flour being run together and mixed and bleached, is not a "patent" flour, but is of less value on the market than "patent" flour. Such a flour, if unbleached, would have a darker color than "patent" flour. The bread made from such a flour, if unbleached, would be somewhat darker in color and would present a less inviting appearance than bread made from a first "patent" flour. "Patent" flour, milled from the same wheat as the flour here in question, would have been better in bread-making qualities and would have commanded a higher price on the market.

I am familiar with the Alsop process used for bleaching flour. process is electrical and the apparatus consists essentially of a cubical box, usually with glass sides, and inside of this box are two terminals of an electrical current, and the upper one of these terminals is attached to a crank shaft that is alternately raised and lowered. When the upper terminal is at its lowest point, it rests upon the lower electrode, or nearly so. When drawn apart by the crank motion there ensues a flaming discharge of electricity. This discharge, at a very high temperature, causes the free nitrogen of the atmosphere to combine with the free oxygen of the atmosphere, producing various oxides of nitrogen, the most important one of which is nitrogen peroxide. When the flaming discharge has been made, a current of air is swept through this box, and by means of a suitable pipe, is carried into what we might call an agitator. These are of various kinds. The one which I have examined in the large mills of Minneapolis consists of a vertical outer shell, made of galvanized iron; in the center is a shaft which stands perpendicular and which is rotating at a high rate of speed. Attached to the shaft are discs, at different intervals, from top to bottom, and these are arranged so when the flour falls on them, owing to the strong centrifugal force, they are thrown out against the walls of the casing. The flour is then conveyed back to the center of the apparatus and once again thrown out, and this is repeated until the stream of flour which enters the top of the agitator is passed out at the bottom. Meanwhile, a current of air laden with peroxide fumes is swept upward through the agitator and the flour is bleached during its passage.

Flour always contains moisture—about 10 per cent. The nitrogen peroxide in the bleaching process comes in contact with the water in the air and in the flour and each molecule of the peroxide, using the double formula, is converted into one molecule each of nitrous Nitrogen peroxide is a dark brownish gas, with a very evil nauseating odor and extremely caustic properties. If inhaled in small quantities it produces a distressing feeling in the respiratory organs, and in large quantities produces death. It is a poisonous Nitrogen peroxide gas corrodes iron pipes with which it comes into contact. The bleaching process makes flour appear whiter. have made experiments on the color of flour by bleaching with large and small quantities of the gaseous medium used in the Alsop process. The color of flour is a compound, made by the two primary colors orange and yellow. When I first determined the amount of orange and yellow in the unbleached flour and subjected it progressively to increasing amounts of peroxide, there was a marked diminution in the orange color and a light diminution in the yellow color, until I reached a point where the desirable color was more nearly approached. I found from that point on if I increased the amount of peroxide that the orange did not reappear, but there was a slight increase in the The amounts of peroxide that I used per million varied from four and one-half parts to one hundred and eighty parts, which is a very wide range. It is probable that for ordinary bleaching, the amounts of nitrogen peroxide that would be used in commerce would run from about thirty-six to seventy-two per million, compared with the weight of the flour. In my opinion, where flour is very vellow and very highly colored, even larger quantities of peroxide may be used.

The statement is commonly made and believed that large quantities of peroxide cannot be used, owing to the fact that it darkens the color of the flour to such an extent that it is not a fit article of commerce. In experimental work, however, I have found that even in such large amounts as one hundred and eighty parts per million, the orange color had entirely disappeared and the yellow had risen no further than it was in the original unbleached flour, and that the flour was very strictly still a commercial article. It was not injured so far as its appearance was concerned and it could be baked into In the case of straight flour, where there were 15 parts of orange and 20 parts of yellow in unbleached flour, on the addition of 180 parts per million of nitrogen peroxide, there remained no orange and only 19 parts of yellow as against 20 parts in the original flour, showing that the work was still within the possible limitations of bleaching. As the miller has no way of measuring or computing the gases, he naturally uses all of the nitrogen peroxide necessary

to bring about a certain color, be it large or small. Bleaching of flour by the Alsop process produces nitrous and nitric acid. Nitrous acid is a corrosive acid which has not been isolated in the pure state. is an unstable acid, constantly giving off peroxide fumes, and when exposed to the air, oxidizes and passes into the higher acid known as nitric acid. Nitric acid is one of the most powerful acids known in It is very corrosive, capable of charring-organic matter, chemistry. turns the skin yellow, dissolves nearly all metals, and forms soluble compounds called nitrates. Nitrites, which may form in the flour from the addition of nitrous acid, are deleterious and poisonous. number of such nitrites may be recovered from the flour by treatment by water, unless the flour has stood for a very great length of time. If taken within a few days after treatment, that is, two or three days, the largest percentage of nitrites that is recoverable from the flour as compared with the amounts used in the flour is from eleven to fourteen per cent.

Assuming that the first analysis of the flour here in question was made immediately after the bleaching and four-tenths of a part of nitrogen as nitrite was found, this would be equivalent to one and three-tenths parts per million of nitrogen peroxide, that is, there would have been used about thirteen and two-tenths parts per million of nitrogen peroxide upon the assumption that the determination was made immediately. The lapse of twenty days, which the evidence shows took place between the time of bleaching and the first analysis of samples of the flour, would, of course, largely diminish the amount of nitrites recoverable by water. Reasoning from experiments made in the Dakota laboratory, which show the amount of loss by lapse of time, it would appear that about forty parts per million of nitrogen The loss of nitrites through lapse of peroxide were used on the flour. time is due to a number of processes. The oil of the flour will absorb The nitrite also enters into combination with the some of the nitrite. gluten, when it no longer appears as nitrite, but is lost beyond recovery. We also know that some of this nitrite is oxidized to nitrate, and it is fair to assume that a portion of the nitrite is lost by volatilization. Again, there is some evidence to show that the cellulose compounds, that is to say, the branny portions of the flour, combine with this nitrous acid and hold it more or less loosely. The amount of nitrite reacting material will diminish even if kept in a tight bottle after bleaching. I have prepared a table of experiments, which shows that after bleached flour was kept in tightly cork stoppered glass bottles for two weeks, at least one-half of the peroxide disappeared, and that by storing for a longer time, it is possible for the nitrites to disappear entirely. No chemist, therefore, can tell by analyzing the flour, unless he knows about how long it has been bleached, how much peroxide has been employed in treating the flour. As a matter of fact, we know from the color experiments that a miller may, and in all probability does, employ with each sample of flour all the peroxide necessary to reach the desired color, be the amount large or small. It is possible to recover more nitrite reacting material from a "patent" flour than from a "straight" flour. The explanation of this is that "straight" flour contains more of the branny particles and perhaps also more of the mineral matter of the flour than would a "patent," and that this acid has entered into combination with these constituents.

The bleaching of flour with nitrogen peroxide gives new flour the general appearance of flour made from old wheat, but it does not improve the quality of the flour. The bleaching process has similar effects on freshly milled flour from properly aged wheat, that is, it makes the freshly milled flour simulate properly aged flour in appearance, but in no wise improves its baking qualities. Flour naturally aged differs from the same flour bleached in that the color is a creamy white and not a chalky white. Naturally aged flour has a better odor and a better taste because aromatic substances are produced during the natural aging and makes a better loaf of bread because of the improvement in the condition of the gluten and the bread is more digestible than bread made from the same flour bleached. digestibility of bread is impaired by bleaching of the flour, irrespective of the amount of bleaching, the difference being only a difference in degree. Nitrite reacting material is not normal to wheat or wheat flour and these materials are not produced by natural aging. bleaching process does not work any favorable change in the gluten. In the natural aging there is a building up from amido compounds into albuminoids, whereas when nitrogen peroxide has been used there is a degradation of the nutritious albuminoids into the nonnutritious and often-times amido compounds. My experiments show that the total nitrogen in flour is unaffected by bleaching, but that there is an actual decrease in the amount of albuminoid nitrogen and an increase in the amount of amido nitrogen: that is to say, bleaching lowers the nutritive value of the flour and there are no compensating features to justify the use of peroxide.

Assuming that the flour in question was bleached with nitrogen peroxide and contains nitrogen peroxide material, it is my opinion, based on a large number of experiments, that this flour was injured as to its quality and digestibility by the bleaching process to which the flour was subjected. It is generally true that the bleaching of flour by nitrogen peroxide gas, diluted with atmospheric air, tends to reduce or lower the quality and strength of the flour. The injury to the flour differs only in degree, depending upon the amount of the bleaching reagent used in bleaching the flour.

Nitrite reacting material is not expelled in the baking process for a number of reasons: First, the soluble nitrites are not necessarily volatile substances; second, volatile substances are entangled in the gluten in the dough and they remain in imprisonment in those little bubbles. If reduced to a gas the result is that when the bread cools down, they go back into combination again. The gases formed by fermentation must remain in the bread during the baking process, otherwise we would have a collapse of the dough and heavy bread. That is one reason why it is not well to injure the quality of the gluten, because it will not hold the gases.

Assuming that the flour seized in the present case consisted of a "straight" grade flour, made out of a mixture of hard and soft winter wheat, mixed with fifteen to twenty per cent of first "clear" old wheat flour, the product is, in no sense, a "patent" flour. It is not even a good "straight" flour. It is a flour that had been adulterated by the addition of "clear" flour; that is to say, it contains more low-grade flour than the wheat would produce. Further assuming that this flour was treated by the Alsop process, the flour was colored or stained in a manner whereby damage or inferiority is concealed; a substance, namely, nitrogen peroxide, was mixed or packed with the flour so as to injuriously affect its quality or strength; and the flour contained an added poisonous or deleterious ingredient which renders the flour or the bread made from it injurious to the health of consumers in the following particulars: First, the bread is less digestible, and if a man persists in eating indigestible things, it is conducive to attacks of what we call indigestion and dyspepsia; second, so far as the addition of nitrites is concerned, it is well known that they have a poisonous action on the human system whereby they destroy the hemoglobin of the blood and depress the circulation.

The statement contained in the specifications for the Alsop patent, No. 759,651, granted May 10, 1904, that there is a diminution of the starch content of the flour treated by their process of 11.87 per cent, with a corresponding increase of proteids, is unfounded in fact. Since nothing has been added to the flour except nitrogen peroxide, this statement, in effect, is that the starch is lost as starch and has been converted into proteids. Such a change in the starch is absolutely unknown in chemistry and it is impossible to make proteids as they are referred to in the specifications. We have never been able even to synthesize a proteid, let alone make it out of hydrogen and carbon and oxygen. I have made total nitrogen determinations of a great many bleached flours and I have never been able to find, where a reasonable amount has been used, that my total nitrogen has risen at all. The statement made in the same specifications that bleaching by the Alsop process increases the nitrogen in the flour is

untrue. To produce the result claimed in the specifications 68,000 parts of nitrogen peroxide per million would be necessary, and the nitrogen produced would not be nitrogen as protein, but would be nitrogen as nitrites or nitrates.

C. H. Barnard, miller for the Hunter Milling Company, Wellington, Kansas; in charge of flour mills for about 23 years:

I am familiar with the mill of the Aetna Mill and Elevator Company at Wellington, Kansas. It is almost a duplicate of the mill of which I have charge. I am familiar with the Alsop Bleacher, have seen it operated, examined bleached flour, and have compared it with unbleached flour. I am familiar with the terms "straight flour," "clear flour," and "patent flour" as commonly understood by millers, bakers, and flour merchants.

"Straight flour" is all the flour obtained from wheat with the exception of 3 to 5 per cent thrown out as "red dog." A few mills make what is termed "100% Straight Flour," and do not make any "red dog;" that is, their straight flour is all the flour obtainable from a given wheat. So far as I know, the Aetna Mills do not take out any "red dog" or low grade. "Clear" flour is obtained from low grade middlings and breaks; the percentage made in different mills varies from 15 to 30 per cent, generally running from 25 to 27 per This would make from 3 to 5 per cent low grade or "red dog" and 70 per cent "patent" and the balance "clear." "Patent" flour is made from the purified middlings which are obtained from the first three breaks. Assuming that the flour involved in this case was a "straight" run of flour made from new wheat, hard and soft, to which had been added 15 or 20 per cent of "clear" made from an old wheat, and that the flour after bleaching and packing was labeled "High Patent," such labeling was a misstatement, as in truth the product was not a "patent" flour. If the flour had not been bleached. it would be inferior commercially to a "patent" flour. Its color unbleached would be darker than a "patent" flour, the effect of bleaching giving it a whiter appearance than true "patent flour." There are three flour mills located at Wellington, Kansas—the Aetna, the Hunter, and the Wellington Mills & Elevator Company, of combined daily capacity of about 3,500 barrels. The Hunter mill does not buy flour from other mills. It did, however, sell "clear" flour prior to the time of shipment of the flour in question to the Aetna Mill & Elevator Company, this "clear flour" being about 25 to 27 per cent of the wheat milled at that time. Such flour in 140-pound jutes, was loaded on cars for shipment or delivered to the Aetna Company.

GORDON SMITH, a baker of long experience, residing at Mobile, Alabama; a member of the National Association of Master Bakers; has attended numerous conventions of that Association; has made a study of the trade from the standpoint of a practical man:

Bleaching flour tends to kill the fine nutty flavor of the wheat. Dough made from bleached flour does not expand so well and you do not get as large a loaf as from unbleached flour. Bread made from unbleached flour has a better flavor and better appearance. ing betters the appearance of the flour, but does not help the bread in any way. Unbleached flour is yellowish before baking, but after baking it whitens. I am familiar with the different grades of flour— "clear," "straight," and "patent"—as found on the market. patent is the highest priced flour. A 75 per cent patent flour is considered a pretty good flour for a baker. Next in rank is the "straight flour," which usually sells at from 25 to 50 cents less than patent. "Clear flour" is a lower grade flour which bakers do not purchase. The baker in buying flour has in the past judged its grade by its color, but in the case of bleached flour this is impossible, as bleaching cannot be detected by mere inspection, and by bakers, bleaching is generally considered a deceit. A mill often takes a "straight flour" and by bleaching it calls it a "patent." It is not a "patent," however, and will not equal a "patent" from the bakers standpoint. the flour considered in this case is a "straight flour" made from new wheat, to which has been added a small percentage of "clear flour," it is not in any sense a "patent flour," but is decidedly inferior to a "patent flour." Bleaching a flour does not aid the baker in any way. It tends to deceive the eye and gives the flour the appearance of a better grade. Aging naturally improves flour; bleaching does not, nor will the flour, after bleaching, improve with age, the bleached flour being at its best when it comes from the mill. The longer it stands the worse it gets.

James E. Lewis, a flour salesman, residing at New Orleans, Louisiana; was for 17 years manager of a 500-barrel mill at Vincennes, Indiana:

I am familiar with the various kinds of flours, both bleached and unbleached. The mill with which I was connected bleached flour and I had an opportunity to observe and to compare it with other flours not bleached. The process used for bleaching in our mills was the Alsop and I was afforded the opportunity to become familiar with the effects of this process upon flour. I understand the expressions "clear flour," "straight flour," and "Patent flour," as used by millers, bakers, and the trade in general. "Straight" flour is all the portions of the wheat fit for human food. "Clear" flour is that portion of

the wheat fit for human food, less "patent" flour taken from it. "Patent" flour is a flour with a portion of the "clear" taken from it: that is, it is the center portion of the berry, the most edible part, and is the highest priced flour on the market. There is about 50 cents difference in the price between "patent" and "straight" and about 65 cents difference in the price between "straight" and "clear" flours. Unbleached "patent" flour is of a lighter color than unbleached "straight" flour, while under the process of bleaching the "straight" may be whiter than the "patent." Unbleached "patent" flour is also lighter in color than the "clear" unbleached. In other words, the lighter the flour in color the higher price it commands in the market, and bleaching makes all grades of flour whiter. Flour naturally improves with age and the bleaching of a fresh flour gives it the appearance of an aged flour to all but the expert observer. bread made from bleached flour has an unpleasant, musty odor. fresh flour makes a slimy dough when used for bread and this condition is not improved by bleaching.

FRED H. KRITE, miller of 45 years experience, residing at St. Louis, Missouri; owner of the mill with which he is now connected:

I am familiar with the grading of flour. "Straight" flour is from 95 to 100 per cent of the flour contained in the wheat. "Clear" flour is from 12 to 30 per cent of the lower grade flour taken from the "Patent" is from 60 to 65 per cent of the best flour in the wheat; that is, it is taken from the first middlings and starchy part of the wheat. Compared with "straight," "patent" flour is whiter and commands a higher price, and between "patent" and "clear" there is usually a difference of about 75 cents in price and a marked difference in color. Prior to February 17, 1909, I used the Alsop process bleacher, but on that date discontinued its use and consequently lost sales to bakers who wanted bleached flour. One baker in particular said "I know I can make whiter bread out of bleached flour than from unbleached flour." The effect of the Alsop process is to turn the flour a deadly white color. It makes "straight" and "clear" flour look like a "patent" and thus enables millers to put off their flour as a "patent" flour. There is a very disagreeable odor connected with the use of the Alsop process. The bleaching gives to a new flour the appearance of an aged flour and makes flour from a new wheat look like flour manufactured from aged wheat. does not, however, improve the quality of the flour. In other words, it is deceptive in that it makes new flour from new wheat look like a better and a whiter flour. If flour be heavily bleached, it is injured and will make a sticky dough but with light bleaching this difference is not so marked. Flour does not improve after bleaching. If we assume that the flour here considered was a "straight" run from

new wheat, to which was added 15 or 20 per cent of a "clear" flour made from an old wheat, the product should be termed "blended flour." It is in no sense a "patent" flour. It is, in fact, lower in grade than a "straight" flour, but by bleaching it passes for a higher grade.

WILLIAM POLLOCK, a miller and millwright of 50 years experience, at present interested in a mill which operates an Alsop Bleacher:

I am familiar with both bleached and unbleached flour and understand the grades of flour as ordinarily used by the milling trade. A "patent" flour is made from the best purified middlings, the highest grade portion of the wheat. "Clear" flour is what is left from the "patent" flour. A "straight" flour is all the content of the wheat except a very small percentage that is cut off as low grade or "red dog." Flour milled from wheat which has been stored for some time is superior to flour milled from fresh wheat, and freshly milled flour is always improved by natural aging. Aging improves the quality as well as the color of flour, while by using the Alsop process there is an improvement in color but no improvement in the quality of flour. To the inexperienced the bleached flour has a whiter color, resembling a high grade unbleached flour, but to the expert it presents a bluish white color which is not as desirable as the creamy white of naturally aged flour. A salesman of a bleached flour can persuade the purchaser to believe his flour to be of a better grade, when, as a matter of fact, it is not as good as unbleached flour with which it may come into competition. Bleaching destroys to a great extent the sweet flavor and rich aroma, which is especially noticeable in hot bread when broken open for use, and gives to the bread an unpleasant odor.

J. J. Brown, of Topeka, Kansas; engaged in the milling business for 23 years in the States of Kansas and Nebraska:

I have worked in a mill where an Alsop Bleacher was operated. The effect of this bleacher was to whiten the product and make the darker flour look like a whiter flour. Unbleached flour seems to have a better flavor than bleached flour; in fact, in bleached flour there seems to be scarcely any flavor, the bleaching killing the natural nutty flavor which the unbleached flour possesses. Unbleached flour is improved in quality and lightness of color by aging; bleached new flour simulates an aged flour, but has a deadly white color, while the naturally aged flour has a creamy white color. Bleaching does not improve the flour other than in color.

CLYDE H. BAILEY, Assistant in Grain Standardization, Bureau of Plant Industry, United States Department of Agriculture; graduate

of the School of Agriculture of the University of Minnesota; has had two years experience in a laboratory of the Howard Wheat and Flour Testing Company of Minneapolis, in which laboratory he conducted chemical and analytical work, as well as operating an experimental roller mill for the examination of the milling qualities of wheat; had nominal supervision over the baking room equipments where daily comparative baking tests were made, for the millers patronizing this laboratory; in 1907 was appointed Aid in Grain Standardization and detailed to Duluth Laboratory, where his work consisted principally of the examination of the grains passing through that market; on March 1, 1908, was transferred to the Bureau of Chemistry, where for the succeeding six months he was employed in the Food and Drug Inspection Laboratory at St. Paul, Minnesota, at which place his principal line of work was the examination of bleached and unbleached flour; at the conclusion of his work in the St. Paul Laboratory, was reappointed to the Bureau of Plant Industry as Assistant in Grain Standardization, his permanent station being Fargo, North Dakota, where he has conducted an investigation of American wheats, particularly as respect their milling and baking qualities:

I am familiar with both bleached and unbleached flour and understand the grades of flour as ordinarily used by the milling profession. Before the process of bleaching became common, the color of a flour determined, to a certain extent, its market value; that is, flours which were brighter or whiter in color, other things being equal, were regarded as the most valuable and commanded the highest price. For example, in the work of the Dakota station, it was found, particularly in the hard winter wheat class, the hard, clear, dark samples possessed, ordinarily, the highest gluten content, yielded a flour brighter and whiter in color than did those of wheat of the same class which contained a considerable portion of the starchy or "yellow berry" kernels, and which samples were also lower in gluten content and consequently poorer in baking quality. The color also indicates to an extent the kind of wheat. For example, Durum wheat flours are in general distinctly more yellow in color than a corresponding grade of flour made from Scotch fife wheat. "patent" flour, as the term has been used in the trade, is a flour produced by reduction of the purified middlings either with or without the addition of certain of the break flour of highest quality. The use of the term "patent" necessarily implies that a lower grade of flour, ordinarily called a "clear" or "bakers' grade," has been separated from the same wheat. A "straight flour" according to trade usages means a flour consisting of practically all the flour portions of the wheat berry. The percentage of total flour which is present in the straight is usually about 97 per cent. "Clear" flour is a flour made

by continued reduction of the purified middlings after the "patent" flour has been separated therefrom, together with the inferior break flour. The color of "patent," "straight," and "clear" flours rank in whiteness in the order named. The percentages of "patent," "clear," and "straight" flour made from any given wheat vary under different conditions.

I am familiar with the Alsop bleaching process and have made a study of bleached flour as compared with the same flour unbleached, respecting taste, quality, flavor, and bread-making properties in general. A flour made from old wheat or conditioned wheat is superior in color and bread-making qualities to a flour made from new wheat, the flour made from new wheat never having as good baking qualities as does the same flour after proper aging or conditioning. flour is whiter than the same flour previous to aging. The Alsop process gives to freshly milled flour a white color, which, to the inexperienced eye, is practically the same change in color that is effected by aging. Few purchasers are able to detect the difference between a freshly-milled flour after bleaching and the same flour after aging. Experts can sometimes detect this difference, especially if bleaching has been heavy, but even the expert may be deceived if the bleaching process has been stopped at the proper point and the inferiority of a freshlymilled flour so concealed that it would appear to be naturally aged. Assuming that the flour which has been seized consists of a straight grade of flour made from new wheat, to which has been added 15 or 20 per cent of "clear" flour made from old wheat, the product would most certainly not be a "patent" flour, but according to market usages and according to price would be distinctly inferior to a "patent" flour. Such a flour could, however, be bleached so as to simulate very closely the appearance of a "patent" flour, and the consumer would probably not detect the difference between this bleached flour and an unbleached "patent" flour made from the same wheat. Aside from the change in color, the Alsop process does not improve the baking qualities of any flour. Where the bleaching has been moderately heavy, the flours are distinctly injured from a baking standpoint. Its elasticity is affected and the bread produced from such flour is less desirable in respect to the texture or moistness of the crumb, the flavor, and odor, particularly the latter two. the bleaching is light, moderate, or heavy, there is never an improvement. Very few mills practice what would be termed light bleaching, the flour commonly found on the market being moderately to heavily bleached, and in these the baking qualities have been injured. Bleaching never helps the elasticity of the dough, but renders it less elastic. The bread often possesses a disagreeable flavor and odor and never possesses the peculiar nutty flavor desirable in bread. The Alsop bleaching process adds to or mixes with the flour a substance, namely, nitrous and nitric acids, which indirectly affects and is injurious to the flour as regarding quality and strength. Bleaching tends to conceal inferiority of flour, makes it simulate a "patent" flour; injuriously affects its quality and strength and adds to it substances which are injurious and poisonous.

Hannah L. Wessling, a chemist and bread-maker employed by the Bureau of Chemistry at the Food and Drug Inspection Laboratory, Chicago, Ill. Received the degrees of B. S. and M. S. in chemistry at the Cincinnati University; taught chemistry three years at the Woman's Medical College, Cincinnati, Ohio, and for two years in the high school at Newport, Ky:

I am familiar with bread made from various kinds of flours, having conducted experiments on the flour involved in this case and compared the resulting bread with a number of breads of standard "patent" flour and in every case found the bread made of bleached flour inferior in color, in volume and in flavor. The difference between the bread made from bleached flour and that made from a standard "patent" flour, purchased on the market, was very marked and could be observed even by an unpracticed eye. The bleached flour always gave a very dull, lifeless gray color and the difference in volume was very marked. Bread made from flour bleached by the Alsop Process may be a little whiter in color than bread made from unbleached flour. Where the bleaching is slight there is not much difference in color. With heavy bleaching the bread deteriorates in color, that is, the color is inferior. There is usually, in the case of breads made from bleached flour, a lack of flavor and very often there is present an unpleasant flavor, but in all cases there is a lack of agreeable flavor.

Gustav Mann, Professor of Physiology, Tulane University, New Orleans, La. Received degree of M. D. and Master of Surgery from Edinburgh and B. S. from Oxford. Has devoted himself to research work since 1887; has published a book on histology and on the chemistry of the proteins. During the last 15 years has devoted himself particularly to chemistry in its relation to minute cells, changes in relation to metabolism and general nutritions; and has published some 30 papers on physiological subjects:

I am familiar with wheat flour, with the proteins contained in wheat flour, with nitrogen peroxide, and with the acids formed when oxygen peroxide reacts with moisture. Assuming that the flour involved in this case was bleached by the Alsop Process, which involves bringing into contact with the flour nitrogen peroxide gas, we have to consider the following points: Flour is made up of about 10% water and 90% of material which is of distinct food value. Of

this 90% of material, about 10% is protein, about 90% is starch, and practically 1% is fat. Of these three substances, protein, starch and fat, the most important, from a nutritive point of view, is the protein. It would be possible for one to starve to death if he got nothing but starch and fat, while it is not possible to starve to death with proteins such as are normal in flour. I have tested the action of nitrous acid on fat to a slight extent, on starch more considerably, but more particularly its action on protein. Fat is changed in such a way as to not only lose its color, but to make it behave in a different way from the normal fat found in flour, because of certain staining reactions, as for example scarlet R or Soudan 3, are not so readily obtained after treatment with nitrous acid.

I have made a series of experiments on the behavior of starch when subject to the ordinary salivary secretion and I find that using exceedingly delicate tests it is possible to show that there is always a distinct change induced in the starch as a result of bleaching, provided this bleaching is beyond what is usually called 4 per million. Even in strongly bleached flour, that is about 7 per million, however, the action on the starch is very slight. This is more surprising when we consider the fact that all acids have a distinct hydrolyzing action on starch food. Since in flour starch is equal, roughly speaking, to 90% of the total bulk, it follows that when flour is subjected to nitrous acid, when used in concentration of 5 per million, the action is in reality restricted to the protein and we have an action of one in twenty thousand. In other words, the expression "5 per million" is made on the supposition that the nitrous acid acts on the whole bulk of the flour evenly, but this in reality is not the case. 1% of fat on which it acts, but it leaves us with practically 90% of starch and 10% of protein, but since it is shown that the action on the starch is slight, it is not only possible, but probable, that the whole action of the nitrous acid will be concentrated on the amount of protein which is present. Therefore, if we apply certain tests, such as digestive tests, it is evident that the amount of nitrate which we can demonstrate in the flour by the usual test is absolutely no index as to the amount of damage which has been done to the protein. For example, a flour which was seized and which contained 7 parts per million of nitrogen, digested more rapidly than another which had been bleached in the laboratory to the extent of only  $2\frac{1}{2}$  per million. The question naturally arises if the amount of nitrates which is demonstrated by the usual means is not an index to the amount of action of the nitrous acid on the proteins, what ought we to do under these conditions? It appears that the only test to be applied in each case is the test of digestibility of a given flour. In addition to action on starch, I have made a number of tests on the proteins of the flour.

Elaborate precautions were taken to get the proteins in as pure a state as I could get them, taking time into consideration. bleached and unbleached flours were taken and subjected to comparative tests. For example, one pound of flour that was bleached and one pound of flour that was unbleached were taken, each made into dough with the same kind of water, kept for about an hour and then washed, first in running water, until no more starch could come out. taken through a mincing machine, kneaded again and more starch liberated. This process was repeated as many as six times so as to get only as much as one per thousand of starch left. Such minute quantities of starch will not in any way invalidate the value obtained. The flour, after it had been washed in this way, was kneaded by hand until all the water possible was squeezed out. With the unbleached flour the protein gluten became so sticky that it could not be readily removed from the fingers; that is, the unbleached flour was much more adhesive than the bleached flour. This gluten was then drawn into glass tubes by suction and these glass tubes, filled with the bleached and unbleached gluten were put in a steaming pan and subjected to steaming. After cooking the tubes were cut out by means of an ordinary file into lengths of about one inch and the gluten was cut across with a sharp knife. These glass tubes containing the gluten, either bleached or unbleached as the case might be, were then subjected to digestion, great care being taken to treat the bleached and unbleached gluten as nearly alike as possible. The digestive fluid used was made up in large quantities and in many instances a tube containing bleached and another containing unbleached gluten were placed in the same glass vessel for digestion. Under these conditions the bleached and unbleached flour were given exactly the same chance of digestion.

Other glass tubes were filled with the whites of newly laid eggs, so as to have a standard for comparison. Now since this gluten material was entirely protected by glass on the sides the digestive fluids could only act from the ends and by looking through the tube it was possible to see the exact amount of digestion which takes place. Measurements were taken with a very fine pair of compasses. The measurements from the end of the glass tube to the end of the digested material were transferred by this pair of compasses to a piece of smoked glass and the scratches on the smoked glass were fixed with varnish and put on the stage of a microscope. The results were magnified 50 times and by means of a special apparatus the image was projected on a piece of paper and the results so obtained were multiplied by two to make the diagram more evident. These results were then plotted on a chart. A few figures, however, will indicate clearly the tendency showed by the experiments. For example, take a flour

called "Golden Drop," which was unbleached and procured in New Orleans, and compare this unbleached flour with a bleached flour seized at St. Louis and which contained 7 per million of nitrogen. was found after 56 hours that the bleached flour had digested to about one-half, the exact figures being for the unbleached flour 100 and for the bleached flour 57. In another case with the same flour, one sample unbleached and the other sample bleached to the extent of 2½ parts per million, the figures for digestion of unbleached to bleached flour was as 76 to 25. This means the bleached flour had only digested to one-third the extent of the unbleached. These figures bear out the same observations made by Professor Halliburton, of London, and appear to establish the correctness of the statement that the amount of nitrogen which can be demonstrated by ordinary methods is no index as to the actual change which has been induced in the protein. The question naturally suggests itself as to whether this deleterious action which was obtained with bleached flour was not due to free nitrous acid or nitrites which might be still in the flour.

Another experiment was therefore conducted in which elaborate precautions to get a gluten free from nitrous acid were made, this being accomplished by repeated washing of the gluten after its passage through a mincing machine. One hundred grams of dry gluten was treated with 10 liters of 70 % alcohol to extract the alcohol soluble protein constituent. The non-alcohol solution protein constituent was then dried and extracted by means of the Soxhlet apparatus to remove all fat. This dry and impalpable powder was once more extracted with alcohol to remove all traces of alcohol soluble proteins. Purified in this way it was found that the non-alcohol soluble protein still gave a distinct nitrate reaction. In addition to making the experiments with gastric digestion, I also tried the effects of pancreatic digestion and found, generally speaking, the bleached flour digested to unbleached flour in the ratio of 40 to 60. Experiments were also made with the insectivorous plant Drosera. plant has flat leaves with about 20 to 30 little tentacles on its surface. Whenever a piece of digestible material is placed upon this leaf the tentacles close over and digest the material by a process which is quite comparable to gastric digestion. It was found by this test that the bleached flour caused the leaves to react a great deal more slowly than the unbleached flour; that is, the effect of bleaching throws an enormous amount of extra labor on the organism. possible, since there is free nitrous acid present, to reason as follows: We have a deleterious action on the living cells by the nitrous acid acting on that cell, for nitrous acid which has been added in the bleaching process and is still in the flour if it be brought in contact with the living cell produces therein some definite injurious effect. Suppose we had nitrous acid as a nitrite in the stomach; when the nitrite comes in contact with the hydrochloric acid there would be liberated nitrous acid. Whether any injurious effect is produced will depend a great deal on the amount in which nitrous acid is present, but if nitrous acid be present even in the very minutest trace it will produce an effect definitely proportionate to the amount in which it is present. That is, if we have present only two molecules of nitrous acid, these two molecules would put two molecules of hemoglobins out of action. Similarly, it would put two molecules of nucleo protein out of action. The latter is a protein found in cell nuclei and it would also, judging by the fact that enzymes are secreted by the nuclei, inactivate two molecules of any ferment that might be present.

Prolonging the time of digestion causes injury. For example, if you take one hour more to digest a meal, the system is working all of that time, which means that it is spending energy which could otherwise be spent for a useful purpose. This would come particularly into play if the digestion of a person were feeble. Apart from the fact that proteins treated with nitrous acid are lessened in digestibility, there is induced in the protein a change in consequence of which that protein becomes distinctly more acid. This was demonstrated by treating bleached and unbleached flour with an excess alkali so as to get the proteins in solution and then titrated back with acid. In addition to the change in digestibility and the change in acid, it is well to notice the fact that one is apt, in employing any kind of a bleaching process, particularly if there be any flour left in the chambers in which the bleaching has been done, to produce a further change in the flour by which it may become poisonous. This stage is reached whenever the flour shows a distinct yellow color. Such protein will show what we call a zanto proteic reaction, the latter compound being distinctly poisonous. They are related to picric acid, a compound which is markedly poisonous. Further than this, if gluten or an animal protein is subjected to full nitrification there is a loss of the two amino-acids, tryptophane and lysin, both of which are absolutely essential to life. For example, chemically pure tryptophane gives with glyoxylic and sulphuric acids a deep violet color. After treatment of a solution of this tryptophane with very minute traces of nitrous acid it is impossible to obtain the violet color which one obtained with a normal tryptophane. Many experiments have been made which show that it is impossible to keep an animal alive if we have present all the different amino-acids of a protein, but no tryptophane. It has also been shown that lysin behaves similarly. Complete nitrification of a protein with nitrous acid leads to a complete disappearance of the lysin, and if not a total, at least a very perceptible diminishing of the tryptophane. Considering that the protein of the flour is its most valuable constituent, it seems that any process by means of which 10% protein present in the flour is diminished should be strongly objected to.

In the bleaching of flour the nitrous acid links on to the protein, or if it has a chance it may link to the potassium, sodium and calcium salts which are constantly met with in all flours. It is therefore natural to suppose that we have present a certain amount of nitrites apart from the nitrous acid which has become linked on to the pro-The fact that bleached flour gives a higher nitrogen value does not indicate that the food value of their proteins has been increased, for we must take into account the fact that the nature of the proteins is completely changed and therefore the amount of nitrogen is of no value in estimating the nitrogen value of a protein in relation to its food value. There is by all bleaching actions necessarily a loss of food value, the degree of loss depending directly on the extent of treatment. In addition to this actual loss in food value, the fact should be emphasized that bleaching has a deleterious effect in that it throws extra labor on the digestive system and means that it does not only act upon the flour, but upon the person consuming the flour by making digestion more difficult. Roughly speaking, this deterioration in digestibility may vary from 20 to 75%, depending on the amount of change which has been induced in the protein as a result of the flour having been subjected to the bleaching process. Nitrous acid, either free or combined, is one of the most poisonous substances which we have. Even in very minute amounts, nitrous acid should be handled with great care. It is conceivable under certain conditions that even very minute quantities of nitrous acid, such as one-half a grain, might be injurious to certain individuals. In considering this it is necessary to take into account the body weight of a patient, and above all the particular condition, at the time, of his circulatory and digestive systems. In feeble individuals it is quite conceivable that a dose of nitrite, which is normal under normal conditions, would cause death. One should be exceedingly careful in handling any nitrites or any nitrates, which, by the bacterial action in the alimentary canal are converted into nitrites. ing therefore should not be permitted.

Dr. J. Birney Guthrie, Associate Professor of Clinical Medicine and Therapeutics in Tulane University, New Orleans, La.; a practitioner of ten years' experience; has taken special interest in the laboratory side of medicine and has done laboratory work continuously throughout the ten years of practice:

I am familiar with NO<sub>2</sub> (nitrogen peroxide), nitrous acid and nitric acid and all nitrates such as would be produced in food by treating it with NO<sub>2</sub> and would say it is a very poisonous substance. Assuming

that in the bleaching process there is added to the flour nitrogen peroxide and nitrous acid either free or combined there is added to the flour a very poisonous substance, and if such substances remain in the bread or other food products made in whole or in part from flour, there would be a risk in introducing into the system such poisonous substances, in any quantity, however minute.

Nitrogen peroxide is a tissue poison and is known to have a peculiar poisonous reaction on different cells of the body. It combines with hemoglobin forming nitro-hemoglobin or met-hemoglobin, which substances are more stable than the hemoglobin itself. The hemoglobin molecule in such combination is for the time being at least unfit for carrying oxygen. This is the characteristic thing in nitrite poisoning, that is, it is the most apparent thing. If one poisons animals with nitrite the blood becomes a chocolate color and instead of the bright red of hemoglobin we see this chocolate color.

This change would be directly proportionate to the amount of nitrite that found its way into the blood. It would be bound to occur no matter what the quantity of nitrite is. In small amounts it might be difficult or even impossible to demonstrate, but this would be only because of the limitations of our methods of investigation and not because these changes had not occurred. Their effects would be the lowering of blood pressure. Nitrites are the favorite means of lowering blood pressure in demonstrating blood pressure phenomena to students. It is conceivable that an individual might react very sensitively in this regard and would react to a much smaller quantity of nitrite than we know will produce these characteristic changes ordinarily. The effect upon blood pressure of an individual of the consumption of bread containing nitrite reaction material should be. if the individual were sensitive enough, a lowering of blood pressure. It is a well-known fact that nitrates may be reduced to nitrites by bacterial action, both in the mouth and in the intestinal canal. Nitrite poisoning has sometimes resulted from this action. Poisoning by bismuth sub-nitrate usually is a nitrite poisoning which has resulted from the absorbing of nitrites formed by the bacterial action on the nitrates. There are well established cases of chronic nitrite poisoning resulting in death and there are also cases of nitrite poisoning which resulted from the effect of faulty protein splitting, forming nitrites in the blood, the result of bacterial life in the bowels. cases have been demonstrated by observation with spectroscope showing met-hemoglobin.

Dr. Hamilton P. Jones, graduate of medical department Tulane University, New Orleans, La. For 14 years assistant demonstrator of general chemistry and demonstrator of physiological chemistry; visiting physician of the Charity Hospital; Lecturer on clinical medi-

cine; was State analyst and at present is State food commissioner of Louisiana; has studied public hygiene and written many articles on various medical subjects. Served as physician in charge of yellow fever hospital at New Orleans and in Cuba and has made numerous trips to the West Indies, Central America and various States of the United States for the purpose of studying various matters of public hygiene and sanitation; a member of New Orleans Parish Medical Society, the Louisiana State Medical Society, the American Medical Society and the American Chemical Society:

I am familiar with bleached flour, the process known as the Alsop bleacher, and with nitrites such as are found in bleached flour and sometimes in decaying vegetation and in life. Nitrites, so far as the result of my personal investigation and experience has gone, are not constituents of living or fresh, healthy vegetables, no matter what kind they may be. I have examined the surface and interior of a large number of fresh vegetables purchased in the markets of the City of New Orleans and found that under no circumstances are nitrites present in the interior of the vegetable examined. In some instances nitrites are found upon the surface of a few of these vegetables and in the case of those vegetables having a natural pink color such as the radish, the beet and the pink portion of spinach, I find that the Griess-Ilosvay reagent gives apparently a reaction; but further testing of these colored vegetables shows that the coloring matter of them is soluble in acetic acid by itself. Inasmuch as the acetic acid is a component part of the above reagent, these tests should always be thrown out on these particular vegetables. are found in all decaying vegetables and the presence of nitrites in a vegetable should decide against its use, inasmuch as their presence would be a positive indication of decay. The presence of nitrites on the rind or surface of vegetables is due to contamination by nitrites contained either in the soil or the water in which the vegetables are washed. Nitrites are not a constituent of animal food and are not found unless such food has been accidentally or purposely contaminated with nitrites, or unless the process of decay or decomposition has begun. Nitrites are not a natural constituent of sound wheat or of sound, unadulterated wheat flour. Nitrites are not the normal constituent of human saliva. To demonstrate this the saliva of some 80 individuals in various conditions of health and disease were examined and in all cases nitrites were present to a greater or less extent, but in the case of seven persons of both sexes and varying ages, in which the parotid glands were catheterized, it was found that the parotid secretions did not contain nitrites when uncontaminated from the mouth.

Three persons were also catheterized and the secretions from the sublingual glands were examined and found not to contain nitrites. These experiments go to show that nitrites are not a normal constituent of salivary juices, and are found in the mouth only as a result of the decomposition of organic matter, or from the partaking of food or drink containing nitrites. The amount of nitrites in the mouth seemed to depend upon the toilet of the mouth exercised by the individual, that is, the cleanliness of the mouth and the condition of the teeth and occur in the mouth as a result of the action of nitri-The general conclusion of the study made of fresh vegetables, fresh meats and animal secretions leads me to believe that nitrites are not a normal constituent or that nitrites are not found in any of these substances unless as a result of bacterial action, or unless they have been added thereto. In nature nitrites are produced from two sources, the most important source being the result of nitrifying bacteria upon organic matter containing nitrogen and the other principal source the naked electric spark, the Alsop Bleaching Process being an illustration of this last method. Nitrites occasionally occur in water and in judging of its wholesomeness, as an article for consumption, their presence is sufficient to condemn the water, in that it indicates active decomposition. Bleaching by the Alsop process adds to the flour poisonous or deleterious ingredients, namely, nitrogen peroxide, nitrous and nitric acids. injurious effect of these added ingredients is in direct proportion to the amount of nitrogen peroxide added to the flour and of course to the amount of the flour consumed. The effect of nitrogen peroxide is, generally speaking, to impair the digestibility of the bread; to tend to produce gastric irritation and for the nitrogen peroxide to form a definite chemical combination with the hemoglobin of the blood which acts to bind the oxygen contained in the blood so tightly to the hemoglobin that it is no longer available and therefore it circulates through the system as a foreign substance, thereby diminishing the functioning capacity of the blood in direct proportion to the number of molecules of peroxide of nitrogen in combination with a certain definite number of molecules of hemoglobin, the injury to the oxygen-carrying capacity of the blood being in direct proportion to the amount of nitrous acid ingested.

In addition to the foregoing testimony depositions taken before William W. Gregg, United States Commissioner for the Eastern District of Pennsylvania at Philadelphia, Pennsylvania, and before Charles K. Darling, United States Commissioner at Boston, Massachusetts, were introduced on behalf of libellant, in effect as follows:

Dr. John Marshall, Philadelphia, Pennsylvania; Professor of Chemistry and Toxicology in the Medical School of the University of Pennsylvania; received chemical training at Pennsylvania College; graduate of Medical School of the University of Pennsylvania; subsequently studied physiological chemistry in Germany, receiving degree of Doctor of Natural Sciences from the University at Tuebingen, Germany:

I am familiar with nitrogen peroxide gas. Assuming that the treatment of flour by the Alsop Process adds to it nitrous and nitric acid, in my opinion, the flour contains added substances which are injurious to health for the following reasons: Nitrous acid has the property of acting upon the hemoglobin, or red coloring matter of the red corpuscles of the blood, converting the hemoglobin into a substance called methemoglobin, which is a combination of hemoglobin and oxygen in which the oxygen is so firmly combined with the hemoglobin, although in the same proportion in which it is in combination in the oxyhemoglobin of the blood, that the vital processes of the body are unable to separate this oxygen from the hemoglobin and make use of it in the oxidation of the tissues in order to produce energy and thus sustain life. It thus occurs that certain quantities of hemoglobin which should be employed in the system as a carrier of oxygen are rendered incapable of performing this function and as the vital processes of the body do not possess the property of separating this oxygen from the hemoglobin in combination as methemoglobin, there is thus a quantity of hemoglobin that is rendered inefficient and may no longer possess the function of carrier of oxygen to the tissues. This methemoglobin must in some way be removed from the blood circulation and this possibly occurs in the liver, which would increase to some extent the work of that organ.

Furthermore, as the quantity of hemoglobin capable of carrying the oxygen is diminished by the quantity of the hemoglobin which is converted into methemoglobin there must be diminished oxidation because of this less quantity of functional hemoglobin. In consequence of this it would be necessary for the system to be provided with new portions of hemoglobin to replace those portions which have been converted into methemoglobin and have been rendered inert as far as their use in the body is concerned, and thus the red marrow in which it is believed the red corpuscles of the hemoglobin are produced in adult life is put to greater functional activity in order to supply this increased demand. This applies particularly to nitrous acid. Nitric acid is also injurious because in the intestinal canal, by the action of bacteria, nitric acid is, in large part, reduced to the condition of nitrous acid which is absorbed. Absorption of the nitrous acid into the blood circulation takes place through the stomach walls and that which escapes absorption at this point will enter the blood circulation through the walls of the intestines. In more detail as to the function of hemoglobin as a carrier of oxygen, as to the separation of the oxygen from the hemoglobin and as to the conditions which make such separation impossible when the hemoglobin is changed to methemoglobin the following facts are true:

The process of respiration in the animal body is practically a chemical process in which oxidation occurs. The oxidation does not occur as far as is known to the medical profession in the blood stream itself but occurs in the tissues and the oxidation is due to the separation of the oxygen from the oxyhemoglobin, which then combines with the tissue material, or food material, which is to be oxidized. anism of the process is this: Man takes into his lungs air which contains oxygen. Venous blood—that is blood in which the major portion of the red coloring matter is present as hemoglobin—comes into the tissue of the lungs, and by a peculiar process air passes through this tissue and comes in contact with the hemoglobin of the venous circulation and the hemoglobin combines with the oxygen and forms The terminal end of the venous circulation is called oxyhemoglobin. veniole; the terminal end of the arterial circulation may be called an They come in close apposition to each other, and as the blood passes into the lungs from the venous circulation oxygenation of the hemoglobin occurs, just as, for example, nitrous acid is brought into contact with a sodium salt and forms a sodium nitrite. For practical purposes it is all an oxide of hemoglobin. The oxyhemoglobin thus formed in the red corpuscles of the arterial blood passes then to the ends of the arteric system, which are in the tissues of the body, as, for example, the muscles,—and there the same condition of affairs exists as to position. The minute vessels of the venous and arterial systems come in fairly close apposition to each other, there being between their ends a mass of tissue in which the high powers of the microscope fail to distinguish any vessels. The red corpuscles containing the oxyhemoglobin from the arterial blood, pass through this mass of tissue to the veniole—the venous circulation—and in doing so deoxidation occurs—that is, deoxidation of the oxyhemoglobin. other words, the oxyhemoglobin in this mass of tissue gives up its oxygen for the purpose of oxidizing the mediums that are there to be oxidized to produce energy to sustain life. Carbonaceous material, carbon dioxide, is formed and is then carried in solution through the blood to the lungs and escapes in the air which is expired, and by insensible respiration through the skin, and is also given off by the urine. In this manner the oxyhemoglobin, oxygenated in the lungs, yields its oxygen to oxidize the materials to sustain life, and is reduced to hemoglobin. This hemoglobin passes through the venous circulation to the lungs where it is again oxygenated. Consequently, there is a perfect cycle of oxygenation and deoxygenation. In other words, the same quantity of hemoglobin may serve as a carrier for an indefinite quantity of oxygen.

Nitrogen peroxide being a chemical entity or individual, has the same effect on the blood and health of the person, no matter how the entity is produced. The person in whose circulation it is introduced has had lessened the quantity of available hemoglobin that is capable of carrying oxygen to oxidize materials necessary to sustain life; has had more work put upon the liver, because the liver must get rid of this methemoglobin which is practically a foreign body in the blood circulation; and must have had produced by the red marrow of the bones, if an adult, a greater number of corpuscles, and hemoglobin therein contained. The word "adult" is used for the reason that in infancy red corpuscles and hemoglobin are produced in the spleen.

Of course, the amount of injury depends upon the quantities of nitrous and nitric acid ingested, but any nitrous acid causes the effects described in proportion to the amount taken. The effects may not be demonstrable experimentally if the amount is very small, but they are there just the same. Further, although the amounts are small, a continuous ingestion would result in a continuous production of If the substances mentioned were ingested at methemoglobin. various periods, there being a considerable interval between them, time would be permitted for the destruction of the methemoglobin and for the reformation of corpuscles and also for the reproduction of hemoglobin. Of course, the strong person could withstand the extra work on the system better than the weak person. natural and probable tendency of the daily consumption of food containing these ingredients would be the production of this methemoglobin in the manner described, and thus a lessening of the oxidative properties of the blood and increased work upon the liver and also upon the red bone marrow in which the red corpuscles and the red coloring matter in the hemoglobin are produced. The process being a chemical one, the chemical reaction occurs to the very end—practically to infinity, and therefore the amount of injury is merely a matter of degree.

Nitrous and nitric acids, to the best of my knowledge and belief, are not natural to flour. Nitrites frequently occur in the saliva of human beings. Their presence, in my opinion, may be accounted for by reason of certain bacterial action. The mouth is a favorable culture ground for bacteria. They are present there in great numbers, and certain bacteria at least have an action on nitrogenous organic matter so as to produce nitrites. The quantity found in the saliva varies. From this fact, and from the fact that bacterial action is continually in progress and also from the fact that the air contains a very slight

percentage of nitrous acid, and in breathing this air is brought into the mouth, I am inclined to believe that nitrites are not a normal constituent of the saliva. In any event, inasmuch as all nitrites have the same action, the nitrites in the saliva, to the extent that they are present there, have an injurious effect upon the system when swallowed, the same as any other nitrites.

The inevitable tendency or effect of the addition of nitrites to food made in whole or in part from wheat flour is to endanger the health of individuals. The general health of a person who is not robust will be more affected than the general health of a robust person.

Dr. Alfred Stengel, of Philadelphia, Pennsylvania; practitioner and Professor of Chemical Medicine in the University of Pennsylvania; has served as Director of the William Pepper Laboratory of Clinical Medicine; is the editor of the American Journal of Medical Sciences; a member of the Association of American Physicians, of the American Medical Association, and of a number of other medical bodies; a writer of text-books and a large contributor to medical literature:

If it be assumed that the bleaching of flour by the use of nitrogen peroxide gas forms in the flour equal quantities of nitric and nitrous acids, which acids, either free or combined, remain in the flour, or in the bread or other food products made therefrom, it is my belief that there is in these products an added poisonous and deleterious ingredient, without regard to the manner of producing the gas and without regard to the method of its application to the flour. my belief that the natural and probable tendency or effect of the consumption of bread, or other foods made from the flour, containing such additions of nitrous acid, free or combined, upon the health of persons consuming it, would be towards several deleterious effects, as follows: First, disturbances of digestion and injurious effects upon the gastro-intestinal tract; second, injurious effects upon the blood and the mechanism that makes new blood; third, effects upon the muscular tissues throughout the body, probably including the heart muscles, all of which effects are injurious. I believe that this injurious tendency will necessarily attend the daily and regular consumption of such food, and that the tendency will exist no matter how small the amount of nitrite ingested. Nitrous acid is a poisonous substance in solution, and in the process of digestion of food containing nitrous acid or a nitrite, it is my opinion that nitrous acid would go into solution and would have a poisonous effect in the three respects already described.

I would define a poison as a substance which, if taken into the body, is capable, through its direct action, of exercising deleterious influences. The fact that such substances may be ingested in the body in such minute quantities as not to cause appreciable, discoverable

effects does not remove such substance from the class of poisons, in my opinion, since it merely indicates that human ingenuity has not yet devised a way of seeing the immediate effects. As an illustration of my opinion upon this subject, I would cite the poison known as tetanus-toxin. It is my opinion that no matter how much a solution of tetanus-toxin may be diluted, and no matter how small a volume may be ingested into the system, the ingestion of such substances will have a deleterious effect upon the system, even though the detection of such effect may be beyond human ingenuity. In my opinion, nitrites are a poison according to this definition. The fact that corned beef, ham, and other food products contain nitrates and nitrites does not alter my opinion that the addition of a poison, such as nitrite or nitrous acid, to a food product is likely to have a deleterious influence. I believe that the fact that nitrites are commonly ingested into the body is no argument that they are not injurious to health, because it is well known that there are constantly formed in the human body substances which doubtless represent the beginning of decay. though these are found in the body, they cannot be assumed to be harmless, and to add to their number from the outside would, in my opinion, increase the injurious substances to which the body is subjected. In my opinion, the fact that physicians administer nitrites as medicine does not justify the addition of nitrous acid, free or combined, to a food made from flour any more than the use of strychnine as a medicine would justify its addition to a food. Strychnine is a valuable medicine and is constantly employed by physicians, but its addition in small quantities to a food which is eaten regularly would, in my opinion, have a deleterious effect. I believe the fact that nitrites occur in human saliva does not indicate that they are not injurious to health, even in very small amounts, and does not justify the addition of more nitrites to a food product and especially to a product which enters into such universal and daily consumption as does flour.

Dr. John H. Musser, of Philadelphia, Pennsylvania; graduate of the University of Pennsylvania; connected with hospitals and medical schools since 1877, and at present Professor of Clinical Medicine at the University of Pennsylvania:

It is my opinion, assuming that the bleaching of flour with nitrogen peroxide leaves nitrous and nitric acids, either free or combined, in the flour so treated, and in the bread made from such flour, that there remains in the flour and the bread made therefrom an added deleterious ingredient, namely, some form or combination of nitrous acid with other material. The use of food containing nitrous acid in some form would have the following tendency or effect on the health of persons daily consuming such food: First, a local irritating effect

on the stomach and intestines, and, second, the general systemic effect which is known to follow the use of nitrates and nitrites, that is, the effect on the circulation of those combinations influencing blood pressure and acting on the blood. The effect of the regular and frequent ingestion of food containing nitrites in small amounts would be the gradual impairment of health, as the digestive apparatus is affected and as the circulatory apparatus is affected and as the blood and secretions are affected.

Nitrous acid in solution is a deleterious substance and nitrites in water solution are poisonous or injurious to health. From the effects of the administration of nitrites for other reasons I would infer that nitrous acid, free or combined, which remains in the bread would be taken into solution while the bread was in process of digestion in the stomach or the digestive canal; and further, that the tendency to affect health would be the same, differing only in degree in the case of a small quantity as compared with the tendency or effect in the case of a large quantity. The effect of such a substance as nitrites might be injurious even when the effect is not demonstrable experimentally or observable by a physician but it could probably be demonstrated if the examination were extended over a long period of time. fact that the amount of nitrites taken into the human system by eating bread made from bleached gour is exceedingly minute would have no effect as to their deleterious nature except as to degree, it being common knowledge that the effect of nitrites is a chemical reaction which is the same whether given in large or small amounts; that is, if this chemical reaction is harmful at all, it is harmful in a minimum amount.

I have prescribed sodium nitrite as a medicine in doses of from one-tenth to one-fourth of a grain, extending at times over several weeks, but the fact that nitrites are frequently given in medicine in no way justifies their addition to any food product entering into daily consumption. In the administration of nitrites as medicine it is frequently necessary to decrease the dosage or to discontinue its use because of headache, but on the other hand, it is sometimes necessary to increase the dose, so that I cannot say that sodium nitrite has a cumulative effect.

The fact that nitrites may occur in various natural or artificial meat and vegetable food products does not have any bearing upon this subject as the effect upon the person consuming such food products would always be deleterious in so far as the nitrite content is concerned. I would advise against the use of such products in all cases irrespective of the quantity of nitrite, provided they were to be taken regularly and systematically as I assume bread is taken.

I believe the nitrite content of human saliva is not a normal constituent, but is a result of bacterial action and may be regarded as an

impurity. Even if it be assumed true, that nitrites are always present in human saliva, in greater or less amount, this fact in no way justifies the addition of more nitrites to the system by the use of nitrogen peroxide as a bleaching agent for flour. The system may develop what is termed "tolerance" to the nitrites contained in the saliva, that is, anything which is taken into the organism, as long as it develops no appreciable or observable effect may be said to be tolerated by the system. But an effect is undoubtedly produced by everything which is taken into the system and we cannot tell when we will overstep this limit of tolerance and produce an observable poisonous effect.

The air after a thunderstorm contains traces of nitrogen peroxide and certain individuals are very seriously affected by thunderstorms and after thunderstorms. In the case even of a normal human being, while it is impossible to live without air, the economy of nature may be faulty when it puts too much nitrite in the air.

In short, I believe the addition of a deleterious ingredient to any food product cannot be justified on the theory or assumption that tolerance may be developed by those who consume the food. It is true there are a great many foods which can be fed to a person in normal health but cannot be fed to sick persons and infants without deleterious results. As a physician, therefore, I would condemn any process of treating flour which introduces into flour such poisonous products as nitrites.

DAVID L. EDSALL, of Philadelphia, Pennsylvania; graduate of the University of Pennsylvania; a practitioner of 15 years experience and at present Professor of Pharmacology and Therapeutics in the Medical School of the University of Pennsylvania:

If flour bleached with nitrogen peroxide contains after treatment and as a result thereof nitrous and nitric acids, either free or combined, which acids, either free or combined, remain wholly or in part in the bread, or other food products made therefrom, it is my belief that such flour, and the bread or other food products made therefrom, would contain an added poisonous and deleterious ingredient. believe that the probable effect upon the health of persons daily or regularly consuming such foods would be detrimental, in that the nitrous acid present would have a tendency to cause disturbance of digestion, to cause changes in the blood and in the circulatory organs, these changes being those ordinarily produced by the administration of nitrites. If nitrites were administered in considerable quantity, the effect would be to cause death within a short period, while in small quantities the effect would be to produce disorders of nutrition, such as commonly result from gastritis, to weaken and impair circulation, and to destroy the functionating capacity of a

portion of the hemoglobin of the blood. Nitrous acid in water solution is a poisonous substance, and if nitrous acid, free or combined, remained in the bread made from flour treated with nitrogen peroxide gas, that nitrous acid would be taken into solution during the process of digestion, and, in my opinion, would have a tendency to interfere with the proper processes of digestion. On the one hand, in my opinion, it might impair the secretion of digestive juices in such manner that digestion would not be carried on properly. On the other hand such nitrous acid might enter into combination with certain constituents of the food itself in such manner as to render such food less capable of being digested by the ordinary digestive processes. In my opinion, the addition of such injurious substances to food may be injurious to health, even when the quantity ingested is so small that such injury cannot be demonstrated experimentally. There are numerous substances that are well known to produce deleterious results when taken over long periods of time in small doses, when similar doses in experiments upon human beings or animals, carried out for the usual periods of experimentation, produce no recognizable bad results. It is my belief that the deleterious results due to nitrites in foods made from flour containing nitrogen peroxide would be the same in all cases, differing only in degree without regard to the quantity of such substance contained in the flour or in the food made therefrom.

I have frequently prescribed nitrites in my practice for a variety of conditions, most frequently for conditions in which the blood pressure is pathologically elevated. The observable effects are to cause reduction of blood pressure and to irritate digestion, the latter effect making the administration of the drug impossible in many cases. my opinion, it is impossible to demonstrate the least amount of nitrite that will produce physiological effects upon the system. my experience, however, I have observed one case in which a disturbance of the stomach was produced by the administration of a single dose of one-eighth grain of nitrite. In this case the patient was under my care for a week previous to the administration of said dose, was in a hospital ward under careful observation, and had not received any other substance which, in my opinion, could have produced such irritation. It is my belief that the fact that nitrites are used in medicine does not modify in any way the fact that nitrite added to food products made from flour may be and does tend to be injurious to health. It is entirely proper to administer nitrite as a medicine for the same reason that it is proper, at certain times, to administer other poisons for the purpose of producing certain effects in pathological conditions, but it is not proper to administer harmful substances for any other purpose than to control the effect of disease. I am aware that nitrites occur naturally in certain food products and believe that, insofar as they do so occur, they are injurious to health. The fact that such foods as ham and corned beef contain nitrites in no way modifies my opinion as to the injurious properties of nitrites in food. I know that it is commonly stated in literature that nitrites are present in the saliva because of bacterial agencies, and believe that such nitrites are injurious to health in proportion as they find their way into the system. It is my opinion that physicians and physiologists generally believe that the poisonous substances found in the body are among the causes that impair health and ultimately cause death. It is my belief that the fact that nitrites occur in human saliva in varying amounts does not justify the addition of more nitrites to the human system through the addition of nitrogen peroxide to flour.

Dr. Otto Folin, of Boston, Massachusetts; Professor of Biological Chemistry in Harvard Medical School; graduate of the University of Minnesota and of the University of Chicago; studied at universities in Sweden and Germany; was Professor of Analytical and Physiological Chemistry in the University of West Virginia, and research chemist in the McLean Hospital of Massachusetts; has contributed numerous papers to scientific journals and is a member of numerous chemical and biological societies:

In my opinion, when flour is treated with nitrogen peroxide gas, there would, in all probability, be formed nitrous and nitric acids. In addition, a portion of the gas would be absorbed and probably would not at once be converted into those acids, but such conversion would, in my belief, gradually take place. The result of treatment of flour with nitrogen peroxide would, in my opinion, be a bleaching of the coloring matter and combination of the nitric acid with the amine groups of the protein of the flour. There would probably be other changes, as, for instance, the formation of diazo compounds with the protein.

It is my belief that nitrogen peroxide added to flour would be injurious to health, and if nitrites enter into combination with the oil or fat of the flour, such compound would, in all probability, carry the nitrous acid through the stomach, through the intestine, into the blood, and from the blood into the tissues, since fats which have such added side groups are probably absorbed directly. It is my opinion, therefore, that such fats would probably be transported to various parts of the organism, where they would be oxidized and the nitrous acid set free in different parts of the body. The nitrites so set free would have the same effect as any other nitrite deposited in the same place, or possibly would be even more effective because of the nascent

condition of the nitrites so liberated. It is my opinion that the nitric acid resulting from the treatment of the flour with nitrogen peroxide would probably partly form nitrates and partly react with the proteins and form nitro-compounds. These, by bacterial action, would probably produce nitrites in the digestive processes. I believe that the effect of nitrites, if they remain in the bread, is injurious to health, their toxicity being in proportion to their amount, except that in the case of very small amounts, the toxicity would be probably greater than corresponding to the amount, that is to say, one molecule, in my opinion, might be more toxic in proportion than a very large number of molecules. The toxic effect would result, in my opinion, from the well-known production of methemoglobin by which the blood loses its power to carry oxygen to the extent to which methemoglobin is formed.

In addition, methemoglobin must be looked upon as an encumbrance to the system, since it is essentially a foreign substance that must be removed. It is my opinion that in flour bleached with nitrogen peroxide the food value of the proteins would be diminished by reason of the effects of nitrous and nitric acids on those proteins, and probably by reason of the formation of nitro diazo and nitroso groups in such proteins, they would not only become less valuable as foods, but also possibly deleterious. This opinion is based on the following reasoning: When nitrogen peroxide comes in contact with small amounts of moisture in the flour, it is probably converted into nitrous and nitric acids. Formed under these conditions. I believe that nitric acid would be very effective in combining with proteins and therefore can give rise to the formation of nitro-compounds. Nitrous acid similarly formed, I believe, would react with the amino groups in the proteins, and, as the result of such action, there is probably formed some diazo compounds and some hydroxyl groups in place of the original amino groups in the protein molecule.

Dr. Augustus H. Gill, of Boston, Massachusetts; Professor of Technical Analysis at the Institute of Technology, Boston, Massachusetts, of which institute he is a graduate; studied at Leipsic, Germany; has held the position of Water Analyst for the Massachusetts State Board of Health; is a member of the Committee of the International Association for Testing Materials; of two committees of the American Society for Testing Materials, and of the Committee of the American Chemical Society for the analysis of oils; has made special investigations for the State of Rhode Island on the action of gas, tar, and oil upon shellfish and for the State of Massachusetts upon the utilization of dogfish and the production of oil from the dogfish; has been retained in a number of cases which involved

phases of the oil or fat industries, and contributed numerous articles to scientific journals:

I have made a study of the effect of nitrogen peroxide upon flour and of certain changes which are produced thereby, giving particular attention to the effect of nitrogen peroxide upon the fat or oil of the flour. The flour used in this work was not commercially bleached, but was obtained unbleached and bleached by me in the course of my investigation. Before bleaching the flour had a rich, creamy color, but after bleaching was dead white. One kilogram of this flour was placed in a gallon bottle and 40 cubic centimeters of nitrogen peroxide gas were added. The bottle was then shaken and allowed to stand 24 hours with two more shakings. The nitrogen peroxide practically disappeared on the first shaking, and the subsequent shakings were for the purpose of making sure of complete absorption and to secure uniformity of the sample. The sample thus treated was found to contain 5 milligrams per kilogram of nitrogen as nitrites in a water soluble form as tested by the ordinary nitrite test. flour before treatment was free from nitrites. The fat was then extracted from the flour by boiling for one hour in a water bath with distilled petroleum ether, filtering and distilling off the ether from the oil. Blanks were again run on the reagents employed. The fat thus extracted was then examined. It was found that a portion of the fat, that is to say, the olein, had been converted into a solid isomer elaidin, and that the nitrogen content of the fat was one and two-tenths milligrams of nitrogen as nitrites per kilogram of the fat. No change in this content was noted after heating for half an hour at 100° C., this being the average length of time and about the temperature to which bread is exposed in baking.

The iodine number of the oil extracted from the flour before bleaching was 101.5, whereas the iodine number of the oil extracted from the flour after bleaching was 98, thus demonstrating that the treatment of the flour with nitrogen peroxide reduced the iodine number of the oil of the flour. The free acid (calculated as oleic) of the oil of the flour before bleaching was 5 per cent, whereas the oil of the flour after bleaching contained 8.5 per cent of free acid. The lowering of the iodine number in this case was due, in my opinion, to the addition of the fat of some other substance, such as oxygen, hydroxyl, another halogen, or nitrogen peroxide. I further found that nitrogen peroxide was combined with this oil in such a manner that it could be separated by washing with a dilute solution of potassium hydrate. Since the nitrous acid thus combined with the fat was not driven off by heating for one-half hour to approximately the temperature at which bread is baked, it is my opinion that it would not be driven off in the baking of the bread, nor do I believe that it would be liberated in the preparation of the flour in the doughing process. The elaidin formed in the bleaching of the flour is a solid substance of more strongly acid nature than olein, the compound from which it is made. This substance, elaidin, or rather elaidic acid, I isolated from the fat and identified. In my opinion, the bleaching of flour with nitrogen peroxide diluted with air adds to the flour a deleterious and poisonous ingredient, namely, nitrous acid, either free or combined. I believe that the amount of such substance added and the method of addition are immaterial, the effect depending solely on the presence of these compounds in the flour.

WILLIAM F. Boos, Jamaica Plain, Massachusetts; a practicing physician and pharmacologist; chemist of the Massachusetts General Hospital; graduate of Harvard University and of Heidelberg; served as Medical House Officer for the Massachusetts General Hospital, and was employed as research student and as assistant to the head of the Pharmacological Institute at Strasburg:

I am familiar with nitrogen peroxide. It is a heavy gas, and has a suffocating odor and a very irritant action on the mucous membranes of the esophagus and trachea. It is a decidedly poisonous gas. It will act as a corrosive agent on iron apparatus about the laboratory to such an extent as to be destructive.

If wheat flour is treated with a gaseous medium composed of nitrogen peroxide diluted with air, the action of the nitrogen peroxide gas would be one of bleaching, which, however, would be dependent upon the presence of a certain amount of moisture, the nitrogen peroxide gas combining with this moisture to produce equal molecular parts, that is to say, one molecular part each of nitrous and nitric acids, the nitrous acid then acting as a bleaching agent to produce a white color in the flour. In ordinary flour there is about 12% of moisture and in bread about 30% on the average. Nitrogen peroxide gas diluted with atmospheric air coming into contact with water or moisture of ordinary wheat flour would have exactly the same chemical reaction as in any case where nitrogen peroxide comes in contact with water, that is to say, there would be a union of the water and nitrogen peroxide with the production of one part of nitrous and nitric acid. Such treatment results in the addition to the flour of deleterious ingredients, namely, nitrous and nitric acids, and their salts. The effect of such added nitrous acid or nitrites would be an injurious one to the system. The nitrites or nitrous acid develop a number of effects upon the organism as follows:

Locally, the nitrites, by being transformed into nitrous acid in the stomach, might produce and do produce a local irritation. After absorption from the gastro-intestinal canal, the nitrites produce specific actions in the organism—the first and earliest one of which is the production of a dilatation of the superficial blood vessels of the face, neck and chest, as also the blood vessels of the brain meninges. As a result of such dilatation there is a flushing of the face, throat and chest, a feeling of fullness in the brain, and a throbbing of the temporal arteries, which is very evident to the person affected. The next phase of the question is an increase in the pulse rate—that is, the pulses are very much quickened,—then there is a falling blood pressure which becomes more and more pronounced as the action of the nitrite is continuous. At this time there is, in all cases, a slight narcosis evident. People affected, or animals affected, will sway and fall, and perhaps go to sleep from the effect of this narcosis. Then if the nitrite is continued, and even in the smallest quantity, there is a tendency of combination between the nitrite and the red coloring matter of the blood, known as hemoglobin, with the formation, as a result, of a new coloring matter called methemoglobin. This methemoglobin is entirely different in its chemical behavior from hemoglobin. Whereas hemoglobin has the property of taking up oxygen from the atmospheric air in the lungs, and passing this oxygen on to the tissues where it is required to carry out the purpose of the physiological economy, methemoglobin cannot take up oxygen, and of course, in consequence of this, can't perform the office which hemoglobin is supposed to perform in the organism. In consequence of this we have air hunger or oxygen hunger, very difficult respiration, and when death occurs as a result of nitrite poisoning, it is due to a transformation on a large scale of hemoglobin into methemoglobin, with consequent asphyxiation.

The tendency of all nitrites remaining in the bread, either those soluble in water or those combined with the oil and insoluble in water, would be as above described, the amount of this effect but not its nature depending on the amount of the nitrite ingested. In other words, nitrites act as such even in the smallest quantity and the impairment of health would be there, even when this small quantity is ingested and would be in proportion to the amount of the substance taken into the system. I consider a poison to be a substance which, by virtue of its chemical constitution, produces certain changes in the morphological, chemical and molecular composition of the organs, these changes leading to disturbances of function in the organ or organs affected. There are substances whose injurious effect depends on the quantity and there are other substances or poisons the direct or necessary effect of which is poisonous in character without regard to the question of quantity. Nitrites belong to this latter class. Nitrites are sometimes found in the human saliva produced by the action of bacteria in the interior of the mouth but they are not normal constituents of the saliva of healthy persons. When the nitrites of the saliva are swallowed with the food, I consider that they are injurious to health to the extent in which they are thus ingested. There is under my observation at the present time in the Massachusetts General Hospital a patient who is suffering from chronic nitrite poisoning as the result of the inhalation of amyl nitrite. The patient has developed marked cyanosis. The amyl nitrite was adminis ered in individual doses which would not produce cyanosis and the symptoms that have been developed are evidence, to my mind, that the toxic effects of nitrites are cumulative. The effect of nitrates or nitrites would be least in a person in the very best of health and would be most marked in children or persons who are not enjoying good health. Appreciable injuriousness might result to the young and weak whereas appreciable injuriousness might not result to the well adult under the same conditions of administration. The injury suffered is dependent upon the power of resistance of the subject taking the nitrite.

Dr. Robert L. Emerson, Boston, Massachusetts; graduate of Harvard University with degrees of Bachelor of Arts and Doctor of Medicine; studied at Strasburg and Berlin; was instructor in physiological chemistry at Harvard Medical School; at present engaged in medical and analytical work in toxicological and medical legal work; has written on legal and medical toxicology; and assisted in writing the second volume of Warton & Stille's Medical Jurisprudence:

Assuming that flour is bleached by treating it with a gaseous medium composed of nitrogen peroxide diluted with air, some of the nitrogen peroxide would probably be held mechanically enclosed within the flour itself while some of it would be adherent and combined with the various ingredients of the flour, namely, the gluten and the oil. With the moisture that is ordinarily in flour the nitrogen peroxide would be split into the so-called nitrous and nitric acids. I believe that in the treatment of flour with nitrogen peroxide the nitrogen peroxide or the nitrous acid would unite chemically with the flour, producing a nitrite or a nitroso-compound. or nitroso-compound would be a poisonous additional substance which would produce an injurious effect upon the blood or upon the system. Nitrogen peroxide at very low temperatures would be a liquid. At slightly higher temperatures it is a gas with a light yellow color, varying to a yellowish brown and at higher temperatures a reddish brown color. It is heavier than air, has a suffocating disagreeable odor and is very irritating to the mucous membrane. is a poisonous gas. Nitrous acid is, strictly speaking, a hypothetical acid and exists only in solution in water and has a hypothetical formula of HNO<sub>2</sub>. We know of its existence and have a right to assume that there is such an acid from its formation of salts from bases. In the case of blood such compounds interfere with the normal functions of the blood as they tend to deprive it of its oxygen carrying power, and thus reduce the system's strength to ward off disease. They would also interfere with the normal functions of the organs of the body and thus be poisons.

Nitrites act on the blood to form methemoglobin and the effect of this is to prevent the blood from receiving oxygen through the lungs and carrying the oxygen to the tissues. This effect is the same, differing only in degree, no matter what the amount of nitrites. nitrous and nitric acid are introduced into flour by the bleaching process, nitrates will be formed and they undoubtedly would remain in the bread. The nitrates remaining in the bread may become changed to nitrites after being taken into the stomach. opinion, such a change would actually take place by bacterial action. Nitrites so produced would have the same effect as nitrites originally ingested with the bread. Further, any nitrite which may be combined with the oil would have the same effect as a soluble nitrite so that assuming the bleaching process introduces these nitrites and nitrates into the flour and that these nitrites and nitrates remain in the bread, there are these three sources of nitrites in the course of digestion, first, that portion soluble in water, second, that portion which would be produced by bacterial action on the nitrates, and third, the nitrites of the oil which are insoluble in water. of the nitrites from these three sources would be the same on the blood and the system.

On March 15, 1910, the court rendered its decree of condemnation and forfeiture in form and substance as follows:

United States District Court, Eastern District of Louisiana.

United States District Court, Eastern United States of America, Libellant. 
$$vs. \\ 420 \text{ Sacks, et al. of Flour.} \right\} \text{No. 14173.}$$

This cause came on before me for hearing on the 19th day of February, 1910.

Messrs. Pierce Butler, Asst. Attorney General of the United States and Charlton R. Beattie, U. S. District Attorney appeared for Libellant.

There was no appearance on said day for the Aetna Mill & Elevator Company, owner of said flour, and the claimant herein.

And it appearing from the files, records and proceeding herein that a libel for the seizure and condemnation of a car load of flour consisting of 16 bales of 24 lb. sacks, 16 bales of 12 lb. sacks, 420 98 lb. sacks and 20 barrels of flour shipped from Wellington, Kansas, to, and into the State of Louisiana, was filed July 31st, 1909; that a warrant of seizure was duly issued and said flour was pursuant thereto duly seized by the Marshal while the same was within the jurisdiction of this Court and being transported from Wellington in Kansas to New Orleans in Louisiana, for sale, and while it remained unloaded, unmoved and in original unbroken packages; That the Aetna Mill and Elevator Company of Wellington, Kansas, duly appeared in said cause on August 11th, 1909, and thereafter, on October 1st, 1909, duly filed its answer to the libel herein,

which answer, on the application of claimant, was pursuant to order of court duly withdrawn and claimant thereafter filed exceptions to said libel—which exceptions were after argument and due consideration overruled, and thereafter the court fixed a time within which the said claimant might make and interpose its answer to said libel; That said claimant refused and omitted to make or interpose any answer to the libel herein within the time so fixed and allowed by the Court, or at all, and claimant having, by its proctors, in open court, declared that no answer would be made by it to the libel herein and all delays allowed by law having elapsed, and no other person having appeared to claim the property seized herein, or any part thereof, this Court duly ordered, adjudged and decreed that said Aetna Mill and Elevator Company and all other persons interested in the flour so seized, be, and it—the said Aetna Mill and Elevator Company was-and they were duly pronounced to be in contumacy and default, and the said libel was duly adjudged to be taken pro confesso against the said Aetna Mill and Elevator Company and all persons interested in said flour seized herein, and that the Court proceed to hear the cause ex parte. And it was duly ordered that the cause be referred to Frank H. Mortimer, Commissioner, to take testimony herein and report the same to the Court; That said Commissioner has duly taken the testimony offered in behalf of said libellant, the United States of America, and has duly reported the same to the Court.

Now, after due consideration and upon all of the testimony, records, files and proceedings herein,—

The Court finds; that there is testimony and evidence tending to prove the allegations of the libel, and accordingly,

That all of the flour described in said libel was and is liable to be proceeded against in this Court and seized, condemned, confiscated and destroyed as adulterated and misbranded and deleterious food within the meaning of the Food and Drugs Act, approved June 30th, 1906, in this, to wit: that all of said flour was, by the claimant herein, the Aetna Mill and Elevator Company, before shipping the same from Kansas into Louisiana, bleached and whitened by treating all of the same by a process known as the "Alsop Process" whereby and by means and reason thereof

- (a) A substance known as "nitrites" has been and is mixed and packed with said flour so as to reduce and lower and injuriously affect its quality and strength;
- (b) That said flour was and is mixed, colored and stained in a manner whereby damage and inferiority is concealed;
- (c) That said flour contains added poisonous and added deleterious ingredients, to wit: nitrites, which renders the same injurious to health.
- And that said flour was and is misbranded within the meaning of said act, in this, to wit:
- (a) That it was offered for sale under the distinctive name of another article,—that is to say, the said flour was offered for sale as "High Patent Flour," whereas, in truth and in fact, it was inferior to "Patent Flour" and was a mixed flour consisting of "Straight Flour" mixed with "Clear Flour."
- (b) That it was labelled and branded so as to deceive and mislead the purchaser, that is to say, each of said sacks and other packages containing said flour was labelled and branded in substance as follows: "Aetna Mills—Aetna Silk—High Patent—Aetna Mills and Elevator Company, Wellington, Kansas" whereas in truth and in fact none of said flour was "Patent Flour," but, on the contrary, all thereof was and is a mixture of straight flour made in July, 1909, out of a mixture of hard and soft new winter wheat, to which "Straight Flour" there was added and mixed a quantity of "Clear" old wheat flour, amounting to 15 or 20 per cent of said mixture.

It is therefore, ordered, adjudged and decreed that said flour (except that which has been released by order of Court), be, and all of same is hereby condemned and confiscated to the United States of America, as being a food adulterated, misbranded

and of a poisonous and deleterious character, and that all of the same be destroyed by the Marshal, and that the said libellant, the United States of America, have and recover of and from the Aetna Mill and Elevator Company, the owner and claimant herein, the costs and charges allowed by law.

NEW ORLEANS, LA. March 15th, 1910.

(Signed) Rufus E. Foster, Judge.

This notice is given pursuant to section 4 of the Food and Drugs Act, June 30, 1906.

W. M. HAYS,

Acting Secretary of Agriculture.

Washington, D. C., May 9, 1910. [No. 382]